COAL AGE

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Direct current is converted Into alternating at Jodie See p. 239

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● **Not** a single lost-time injury was incurred in reopening the shafts at Old Ben No. 11 mine in Illinois after they had been plugged with clay to kill a shaft-bottom fire and explosions. Following recovery, the operation was mechanized, permitting one side of the mine to be completely sealed. Details of both recovery and mechanization are scheduled for publication in a forthcoming issue.

● **Records** were smashed again at the Mining Congress convention and equipment exposition at Cincinnati last month. Highlights of the eight technical sessions are reflected in the report beginning on page 259; the exposition side of the show is described and illustrated in the story starting on page 270; a convenient equipment check-list for readers will be found on pages 281 to 286.

● **When** competitive conditions curtailed their markets for thick-seam coal because of its friability, Excelsior (Arkansas) operators turned to the harder thin-vein coals. Room-and-pillar methods, however, proved too costly. How a more economical longwall conveyor system was developed to meet this situation will be told in an early issue by Degan Boyd, general manager, Excelsior Coal Corporation.

● **Reversing** the usual order by converting direct to alternating current enabled the owners of the 25-year-old Jodie power plant, producing direct-current power, to compensate for a drop in original mine load by serving a more distant operation. How this was done and how the plant was changed to stoker firing is described in the article beginning on page 239.

● **This** is the season when one convention treads upon another's heels. In July, for example, Coal Age will report the Denver meeting of the Rocky Mountain Institute, the Indiana Mining Institute at Terre Haute and the annual boat trip of the Illinois Mining Institute. Month-end journeyings will take in the Mine Inspectors' convention at Columbus and the Mining Society of Nova Scotia at Halifax.

● **British** coal-trade experience under government regulation acquires an added significance on this side of the water as we embark on another experiment in federal control over coal prices. Paul Wooton, recently returned from a trip abroad, where he interviewed representatives of producers, labor and consumers, gives his impressions of the workings of the British system in the story on page 295.

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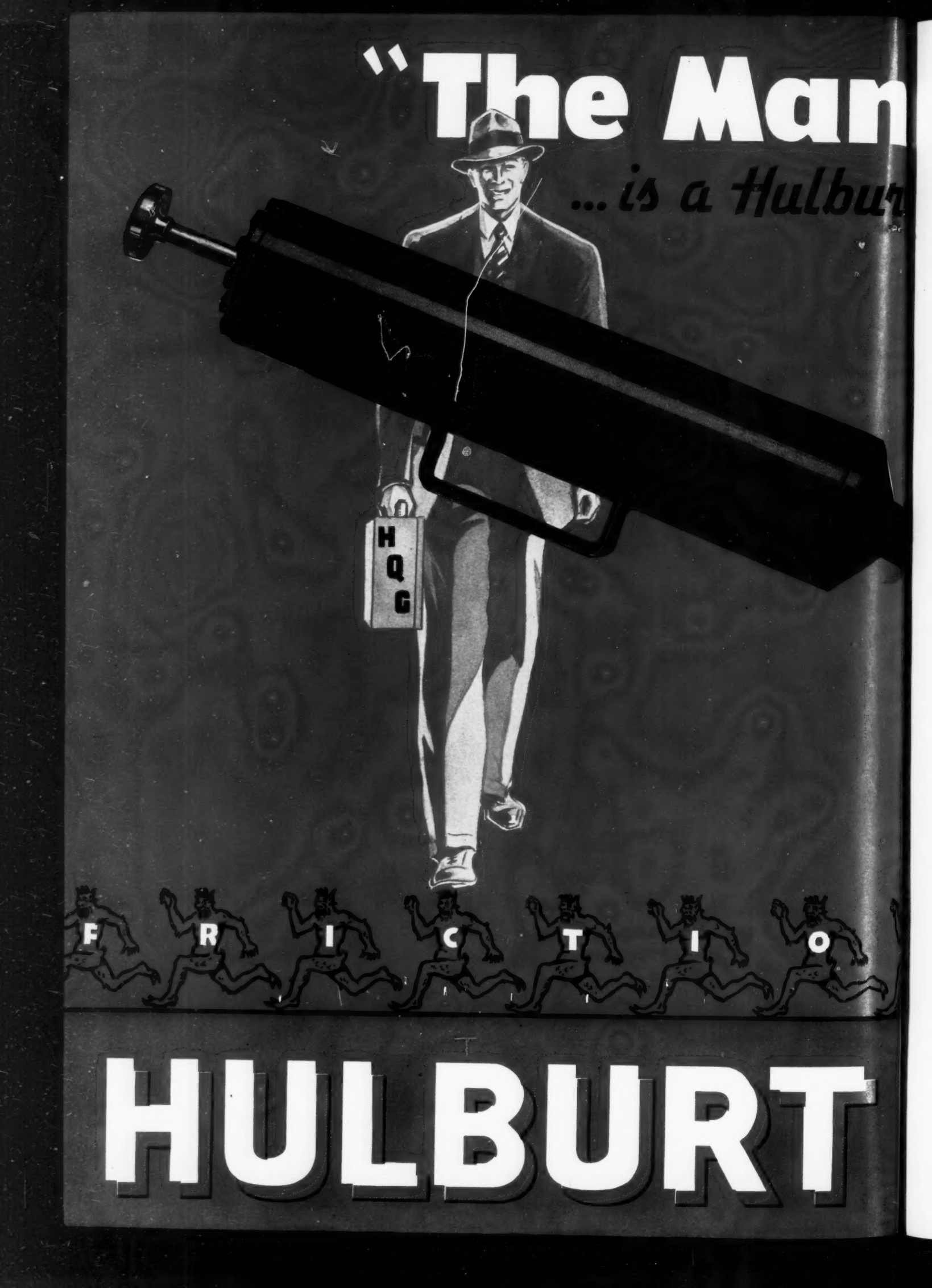
"The Man
...is a Hulbur
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COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

June, 1937

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Ages Upon Ages

LESS THAN one per cent of the coal deposit of the United States has been mined or wasted in mining since the industry first began. The exact figures are 0.941 per cent of the coal under less than 3,000 ft. of cover and 0.792 per cent of the coal under less than 6,000 ft. of cover. In each case, the estimates include only seams 14 in. or more in thickness.

One cannot conclude, however, that because coal mining became firmly established as an industry about 100 years ago, the coal available will last 10,000 years, for the output, though smaller than it has been, is still many times what it was in 1837. And, despite all economies, it is likely that more coal will be used before many years than at any previous time. On the other hand, waste in mining may be reduced from the 50 per cent of the estimate and seams under 14 in. thick may be mined.

Assuming, without claims to the prophetic instinct, that the average tonnage for the years to come will at least equal the 1911-1925 average of 543,000,000 tons annually and that the waste is still 50 per cent, the life of the coal wealth of the country shallower than 3,000 ft. with coal thicker than 14 in. will be about 4,000 years and will end almost as far from our time as is Hammurabi, the lawgiver, of Babylon.

Extinguishing Fires

TWO SUGGESTIONS on extinguishing fires tread on one another's heels—one from Manchester, England, and one from the University of Iowa. In England, dump fires have been extinguished by the use of limestone dust and water. The limestone reaching the fire produced carbon dioxide, and that inert gas excluded oxygen and the fire died. During the World War, limestone dust was spread on burning dumps so that they would not flare and give direction to bombing aviators. At the University of Iowa, a crude aluminum sulphate is mixed with calcium carbonate and spread through the stored coal; whenever the mixture gets wet, carbon dioxide is generated.

Both methods are suggestive. The first is of no value unless the point of extreme heat is reached. Dolomite would be better than limestone because it gives off carbon dioxide at a lower temperature and is denser. The Iowa plan would work without heat, but is of value only where small interstitial spaces have been filled with gas. Perhaps either method would be better than the use of culm for flushing fires in solid coal, which anthracite producers naturally favor because, while effective, the culm has been a waste product. The French also might find the new method better than *embouage*, or pumping of mud into burning pillars from the side of the coal rib.

Tomorrow's Homes

HOME BUILDING is sharply on the upgrade. One well-publicized forecast, for example, estimates that new housing facilities will be built for 425,000 families in 1937. This upswing presents both an opportunity and a challenge to coal and its allies. The opportunity needs no ballyhoo; the challenge, however, demands emphasis and reiteration because there are many in the industry who prefer to ignore its implications.

For the most part, the domestic coal stoker has moved triumphantly into old cellars; in far too few cases has automatic heating with

solid fuel been part of the planning for new houses. Replacement of antiquated plants with modern equipment in existing homes is highly desirable and efforts to dominate that market should not be belittled. But unless a greater drive is made to put coal-burning equipment into the new dwellings, the replacement business will dwindle simply because lack of installations in new homes will stamp the use of coal as a fading one in modern home heating.

Impartial analysis of comparative comfort, cost and convenience values will disclose that such a conclusion is not warranted. Sober facts, however, are not enough; the analysis must be sold to a public already impressed by the claims of rival fuels. The advantages of coal must be dramatized and that presentation shot through with social as well as financial appeal. Vigorous invasion of the new-home market will be the best possible protection in holding the old.

Selective Mining

WHETHER it is best for mine owner or the country in general that selective coal mining be continued is a question which should never be allowed to drop, for it never will be settled in favor of that practice until the advance of mechanization has been halted and then only until new heights of economical mining are reached. With selective mining, not only is coal wasted but development and equipment costs, pumping and ventilation efficiency also suffer. By bringing out all the coal and cleaning at two gravities, a high-grade, a middling and a refuse product can be made, with the first product the equal or superior of that obtained by selective mining.

In most instances it would seem better to mechanize, clean the smaller coal thoroughly and clean the larger coal by careful hand-picking under a good light than to depend for good coal upon selection over a wide area with mining methods that hamper production. The mine will last longer, the equipment and the village will have more tonnage on which to be amortized; work will be concentrated; haulage, ventilation, pumping and supervision costs will be lowered; a cleaner first-quality coal will be produced, with a large quantity of second-class coal suited for relatively local trade where cleanliness is less of a desideratum because no alien mineral matter will have to be transported to market.

How Significant?

MUCH ADO has been raised on this side of the water over the recent award of the British Coal Royalties Valuation Tribunal, setting the terms upon which privately owned mineral rights are to be surrendered to the government. This "nationalization" measure is held up by some both in contrast to our own system and as a veiled threat of what the American mining industry may face if it does not mend its ways. Neither the present decision nor the background of the royalty picture in Great Britain, however, seems to justify any dire conclusions that a similar situation is likely to arise in this country.

From time to time, it is true, there have been suggestions that Uncle Sam, or some other Santa Claus, purchase marginal mines and undeveloped coal acreage and withdraw them from actual or potential competition. Such a proposal was embodied in Title II of the original Guffey-Snyder bill and fell by the wayside. The scope of purchase there contemplated was distinctly limited and the primary objective was more rigid control of competition. In Great Britain, where coal-land ownership is largely divorced from operation, the difficulties of assembling an adequate acreage and the lack of assurance that individual leaseholds could be renewed on favorable terms have been stressed repeatedly as handicaps to economic development and deterrents to extensive capital investments by the producers.

As a result, government purchase of all coal mineral rights and the leasing of such rights to operators on terms which would promote adequate, large-scale development long has been urged. This purchase the present award facilitates, but actual acquisition of the mineral rights awaits enabling legislation. All the award does is to fix the terms upon which the purchase is to be made. Operation of the mines still remains a private venture under government control.

JODIE PLANT CHANGES

+ Include Pneumatic Spreader Stokers

And D.C. to A.C. Inversion

HOW to utilize a direct-current generating plant with a capacity considerably in excess of a demand which had dropped as a result of depletion of sections of the adjoining coal areas was solved by officials of the Gauley Mountain Coal Co. in an unusual manner which proved an economic success. The solution of the surplus-capacity problem consisted of arranging equipment for converting direct to alternating current, stepping the latter up to 13,200 volts and transmitting it several miles to another mine of the company. Last December the plant was further improved by the installation of pneumatic spreader-type stokers.

The power plant in question, located at Jodie, W. Va., on the Gauley River eight miles above its confluence with New River, was built in 1913 and for some time served three Gauley Mountain mines. Plant equipment consisted of two 252-hp. B. & W. Stirling water-tube boilers with hand-fired furnaces, one Erie-Ball-and-Westinghouse 300-kw. 600-volt d.c. generating unit, and one Ridgeway 200-kw. 600-volt d.c. unit, both operating non-condensing.

Through the years the plant proved a reliable source of power and gave a low cost when properly loaded. It was maintained in unusually good condition. A management policy of encouraging long-term service of competent power-plant help played a large part in the high standard of service and maintenance. When the mine load dropped to a small value, the power-plant crew was rewarded for its past skill and service by improvements to the plant and continued jobs instead of a complete shutdown in favor of purchased power.

After 1926 only the Rich Creek No. 2 Coalburg mine was operated at Jodie; daily production at this operation was 500 tons or less. Last year, the No. 2 Coalburg was replaced by a new 500-ton mine—Rich Creek No. 2 Splint—on the opposite side of the valley but delivering its output to the old tipple, which, however, was modernized as to its screening and loading facilities. The power plant is adjacent to this tipple and coal is delivered from the tipple to the boiler room over a short conveyor.

A second tipple, serving the Agnew No. 2 mine of the company, is six miles by railroad up the valley from Jodie. This tipple, built a few years ago to replace the one formerly operated at Ansted, operates double-shift and ships 1,400 tons per day. Surplus power is transmitted from the Jodie d.c. generating plant to this Agnew mine. Sufficient power to satisfy the requirements over and above the supply coming from Jodie is purchased from the public service company.

To make the change from 600 volts d.c. to 2,300 volts a.c., a Westinghouse 500-kw. synchronous motor generator was installed in a small addition to the engine room and its control panels were grouped beside the main generator panels. A bank of three 200-kva. 2,300-13,200-volt outdoor transformers with the necessary switches completed the equipment added to the Jodie plant.

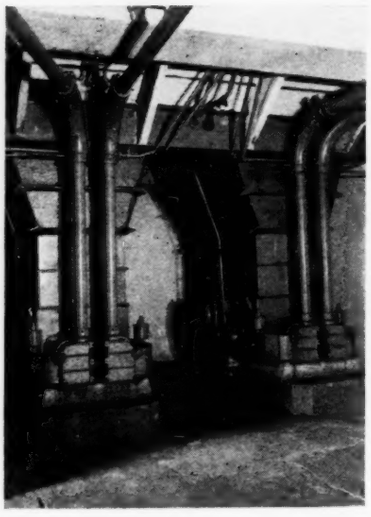
The 21,000-ft. line for transmitting the 13,200-volt power to Agnew No. 2 was built with creosoted long-leaf pine poles carrying three

New utilization gave this 25-year-old d.c. generating plant a load of 150,000 kw.-hr. per month. Output of the new mine is brought to the tipple through the conveyor gallery in front of the power plant

copper-weld conductors each with a conductivity equivalent to No. 4 copper. Because the terrain is rough and many of the spans exceed 500 ft. (two are over 1,000 ft.) double-pole construction with a double steel angle crossarm is used and the conductor spacing is 7 ft. Line and transformer capacities are adequate for supplying 600 kva. The line terminates at a switch tower adjacent to a 600-volt d.c. substation at Agnew No. 2; three 200-kva. transformers are installed at that point for stepping the voltage down to 2,300. The substation contains three 200-kw. synchronous motor-generator sets, one of which is equipped with full-automatic remote-starting control.

Any one of the three m.g. sets can be driven either from the Jodie power plant or from the purchased-power line and the usual working shift requires that two be used. One is operated from each source—with the one on purchased power slightly underexcited—and the d.c. outputs are paralleled. Load relays automatically raise the voltage of the opposite unit in case the one operating on Jodie power becomes overloaded. The 500-kw. m.g. set at the power plant is operated 16 hours per day—that is, to include the two shifts working at Agnew No. 2. During the remaining 8 hours so little power is required there that it is cheaper to purchase it.

Because the ordinary frequency meter was found lacking in the sensitivity required to regulate the frequency of the a.c. output of the power plant m.g. set to a nicety permitting satisfactory parallel operation of the substation m.g. sets, a synchroscope was provided, excited on one side with a regulated frequency from a 110-220-volt line connecting with a power company supply which serves a few private homes a short distance from Jodie. An automatic transfer switch puts the power-plant lighting circuit onto this supply in case of local power failure. This service connection to the power plant costs less than $2 per month.



The two dual stoker units are installed in space formerly a part of the coal bin used with hand-firing

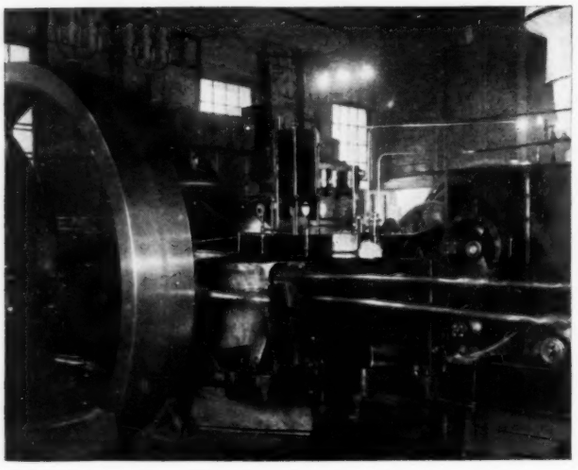
During a typical full-time month 98,000 kw.-hr. of a.c. power was generated by the power plant and 38,000 kw.-hr. was purchased. In the same period 22,000 kw.-hr. of the 600-volt d.c. power was supplied from the power plant to the adjacent Rich Creek No. 2 Splint mine. A recent check of the ratio of d.c. input to a.c. output of the m.g. set showed that the average conversion operating efficiency of the load is 73 per cent. Thus by calculation it is evident that over 150,000 kw.-hr. is generated by the power plant in a month.

After the 500-kw. m.g. set was installed, thus making a.c. power available at Jodie, a 200-hp. a.c. motor was put into regenerative braking service to excellent advantage on the monitor incline of the new Rich Creek mine and several a.c. motors were installed on other jobs in place of the d.c. motors formerly used. Making a.c. available for motor drives at Jodie was another advantage incidental to the d.c.-to-a.c. conversion scheme. To operate the monitor drive, lighting and other a.c. motors at Jodie during the hours that the power plant m.g. set is not running, a.c. is brought from the purchased power supply at Agnew over the 13,200-volt transmission line.

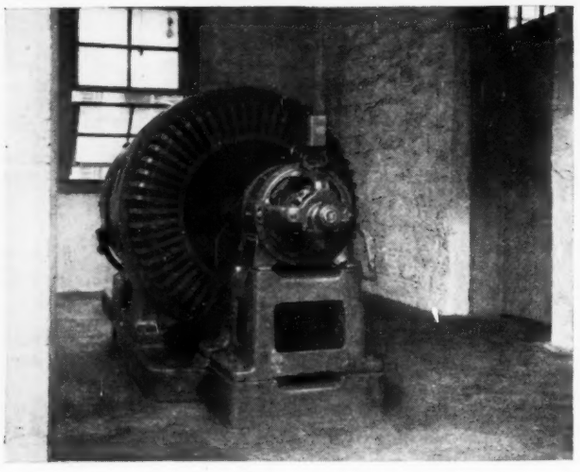
Success with this new utilization of the plant led to making the boiler-room improvements, consisting of stokers to replace hand firing. With the increased load the firing had become a task rather strenuous for one man and it was necessary to use a 4x2-in. coal of high market value. Stokers would ease the labor of the fireman and effect a saving by a change to screenings as fuel.

Each boiler, therefore, was equipped with one Type PS 20 dual unit pneumatic spreader type Iron-Fireman stoker rated to handle 2,000 lb. of coal per hour. This equipment was selected because (1) the relation of the existing fuel supply and storage was ideal for that type; (2) interruption of service could be held to a minimum because a large part of the installation would

Excellent maintenance was a factor in extension of the plant's useful life. In the foreground is the 300-kw., 600-volt, d.c. generator

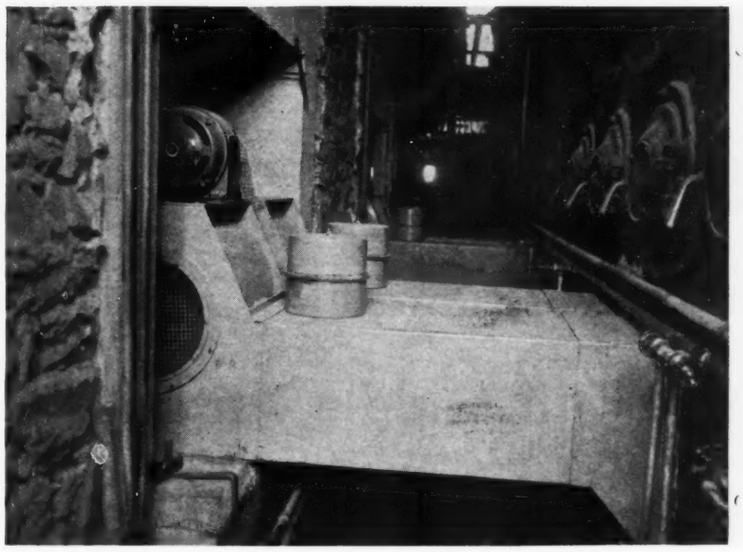


Direct current is changed to alternating by this 500-kw. synchronous m.g. set installed in an addition adjoining the engine room



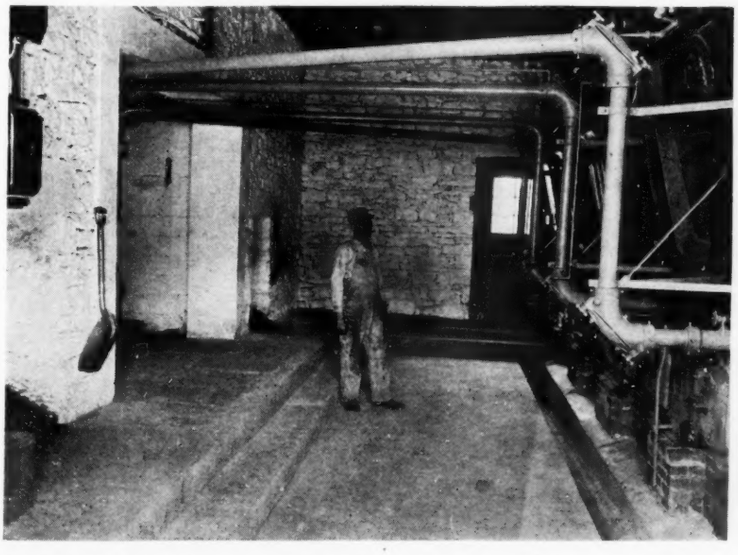
be accomplished before it would be necessary to shut down a boiler; (3) simplicity and compactness of the unit itself. The two units were installed side by side on what was formerly the bottom of the hand-firing fuel bin. Just the necessary space was walled off, thus leaving a portion of the bin undisturbed for emergency hand-firing.

Principal changes to the boiler settings included new stationary gates set 24 in. lower than the ones replaced; new lower fronts with doors for cleaning, emergency hand-firing and ash removal and floor-level ducts under the settings from the rear to conduct combustion air supplied by forced-draft fans. The latter units, which include automatic dampers, are installed in openings cut through an 18-in. stone wall separating the boiler and engine rooms. The plan is to fit the fan intakes with valves so that the air can be taken either from the boiler room or the engine room, as best suits the season.



Forced-draft fans with automatic dampers are installed in alcoves made in the engine-room-boiler-room division wall

Four 3-in. pipes looped overhead conduct the air-coal stream from the stoker mixing boxes to the furnace nozzles. Steam-heated bends reduce the chance of fine coal clogging the pipes in case of unusual wetness. These heated bends have proved effective with fine coal of any moisture content less than that which will permit the coal to be balled in the hand.



Fuel pipes are carried overhead from the stoker alcove (left) to the spreader nozzles in the furnaces, which were equipped with new lower fronts and rebuilt to drop the grates 24 in.

Four high-pressure fans built into the stoker units proper perform the duty of conveying the coal through the pipes and spreading it evenly over the grates, and in so doing supply about 25 per cent of the air required for combustion. The equipment is designed to use 1½-in. screenings, but at Jodie 2-in. screenings have been handled by the stokers with entire satisfaction. The feed screws have lugs which effectively break any reasonable quantity of oversize coal. At present, minus ½-in. coal is the fuel used for regular operation.

Forced-draft dampers and the stoker units are controlled automatically by a contact-making steam gage which is adjusted to start the stokers at 130 lb. pressure and stop them at 135 lb. A timing relay operates the stokers, but not the forced-draft fans, for 30 seconds after any 5-minute idle period. Relays are adjustable both as to period and interval.

Rich Creek No. 2 Splint mine, which supplies the fuel handled by the stokers, is in the Coalburg seam. This coal bed consists principally of splint but also contains a layer of gas coal. A channel sample of typical character will contain approximately 36 per cent volatile matter, 4.6 per cent ash, and 0.7 per cent sulphur. The heating value is slightly over 14,000 B.t.u. and the ash-fusion temperature is above 3,000 deg. F. The minus ½-in. coal used by the stokers averages 8 per cent ash.

With the pneumatic spreader stoker it is estimated that most of the fuel below ⅛-in. burns in suspension. The large quantity is indicated by the fact that within 24 hours the ash accumulation on the floor in the last pass would, if not removed, cover the bottom drum. Hopper floors and steam injector conveying pipes were installed to blow this fly ash back into the furnace.

With its new stokers and an assured demand for capacity generation of 600-volt d.c. by reason of the new mine and the d.c. to a.c. outlet for surplus power, the Jodie plant, now approaching its twenty-fifth year, may possibly serve for another quarter of a century. Local officials who are concerned with the power plant are R. H. Morris, general manager; G. E. Hoover, chief engineer; and R. F. Overly, superintendent, Jodie mine.

STRIPPING PRACTICES

+ At Merriam and Other Pits, Western Middle Anthracite Field

IN ANTHRACITE strippings more and more emphasis is being laid on the use of long booms because, with shorter reaches, the stripping shovel or dragline excavator must place the stripped material so close to the strip pit that steeply pitching measures cannot be followed down to as great depths as is desirable.

Thus, at the Merriam stripping of the Merriam Coal Mining Co., near Mt. Carmel, Pa., where the coal is being uncovered and loaded by the Rhoads Contracting Co., the coal was stripped originally with a dragline excavator having only a 50-ft. boom. After a lift of about 25 ft. had been made, nothing further could be done without reshoveling or redraglining the material by which what would be the working berm for another cut was encumbered, and this could be transferred at a cost only a little lower than was involved in its first handling. A dragline excavator with a 70-ft. boom, though only 20 ft. longer, will put the material 40-ft. further and at a lower level on the slope of the hill; this will enable the excavator to make three or four lifts of equal depth without repiling the spoil.

Same Units Strip and Load

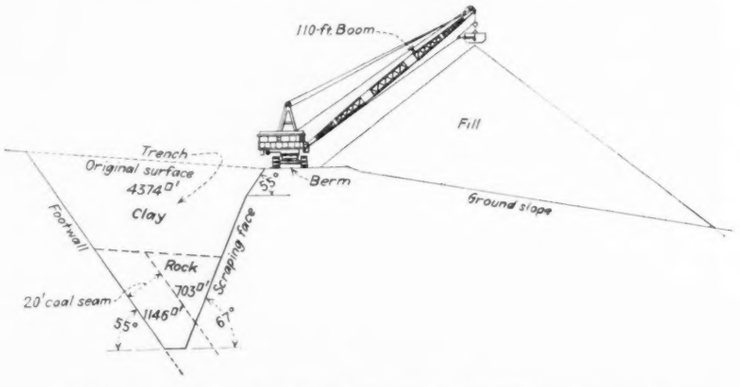
At this Merriam operation, the same units strip the coal as load it into trucks. These transport it to the railroad, whence it is taken in railroad cars to Shamokin to be prepared by the Rhéolaveur process in the Neilson breaker, originally constructed by the Shamokin Coal Co. Before operations commenced, the outcrop at this stripping had been riddled by bootleggers, and the caving of breasts driven almost to daylight had potholed the surface. Since stripping has revealed the exact locations of these breasts, care has been taken not to loosen or strip any more cover than necessary above these barren sections.

In dragging overburden, some dirt inevitably falls back over the coal face and must be removed by the excavator. Sometimes coal and rock are so intermingled that the excavator has to take one or more bucketloads of coal so as to be able to get at this rock. This coal is placed by the dragline to the back of the cut near the footwall of the seam so that it can be recovered later when the excavator, having ceased to strip coal, reverts for a while to its other function of loading coal into trucks. By using one dragline for both functions, problems relating to a balancing of capacities of stripping and loading units respectively disappear.

In this stripping, the pillars are sufficiently broken by the action of the shots in the overburden and by the loads imposed on the coal, especially at the pillar edges, that the bucket can lift the coal if the dragline works from the free ribs of the breasts on either side toward the solid. In consequence, no one need descend into the cut.

The scraping, or cutting, face can be scraped, therefore, to a far steeper pitch than would be safe if men had to work in the bottom of the pit. This and the fact that the bedding planes of the rock run into the bank, giving maximum stability both to the scraping face and to the berm on which the excavator stands, make this work exceptionally safe. In any case, the contractor need be at little pains to satisfy himself that the scraping face is so sloped that it will be free from minor caves. Should the slope slough, he can easily lift out of the pit any material which may have fallen into it.

After the contractor has developed the positions of the breasts, he is careful to avoid shooting down the



Method of drilling and digging overburden and placing spoil

top above them and starting a run in them, which might take not only rock but coal also down into the old mine excavations and also might destroy the berm on which the excavators stand. When the coal is being stripped by a dragline, the breasts do not have to be filled tight with overburden, for no track has to be laid directly at the level of the top of the coal seam. Where it is so laid, accidents to men and equipment frequently occur, because this part of the work frequently is so unsuccessfully performed that the equipment loses its balance and rolls over. With a dragline excavator set on top of the berm and care taken to avoid shooting above breasts, the excavator rests on the several feet of unbroken rock by which the opening is spanned and, if the operative fills the latter with refuse, he does so merely to avoid lifting so much rock to the surface and not to afford support.

Only the roof over the pillars is shot, and this by vertical holes of 6 in. diameter and, where there are three 25-ft. lifts, these are sunk to a depth of 74 ft. Such holes at the bottom are 25 to 30 ft. from the toe of the scraping face. Holes are chambered with charges of 60 per cent dynamite and shot with the same explosive. The position of the chambering and the quantity of explosive used vary with the shape and weight of the overburden.

Shots are drilled by two caterpillar-mounted Sanderson Cyclone drills, which are readily placed at the edge of the berm because of its evenness. Much effort has been expended by manufacturers to reduce the shocks which drilling imposes on the rigs by which it is performed. One of the rigs at the Merriam stripping has a hydraulic spudder, or oscillating lever, for raising the tools and then permitting them to fall. The other has the latest development—an air-speed spudder.

These make it possible to use steel instead of manila rope, yet the air-speed spudder takes away, it is asserted, only 4 per cent of the cutting energy of the falling tools—far less than with other methods of control. Steel rope is cheaper and more durable than manila cable. The spudder relifts the tools after they have fallen a distance of about 2 ft. and permits them to fall almost unrestrictedly into the bottom of the hole, assuring fast cutting.

At the Merriam stripping the coal at the eastern end is 15 to 20 ft. thick and pitches about 45 deg. At the western end, the bed splits. The coal is being stripped by three dragline excavators; two of them are electrically driven, have 70-ft. aluminum booms and 3½-cu.yd. buckets, and the third has a diesel drive, a 110-ft. aluminum boom and a 3½-cu.yd. bucket, this last unit being about the limiting size for a truly portable excavator.

The same bucket is used both in placing coal in trucks and in handling stripping. Thus the contractor gets full service out of his equipment. With a dragline excavator he does not have to make his pit wide enough to accommodate excavator, trucks or cars, and turning space. With trucks he escapes an investment in track with its high cost and uncertain salvage value. Accordingly, if the company for which he is working decides that it wants more of a certain kind of coal, or more coal of a kind less expensive to mine, the contractor has nothing on the job but what can be transferred to another location at a few hours' notice and with minimum loss. If he has no opportunity to operate the unit at another point, he can strip all movable parts from the excavator and leave it without even a watchman.

A seam of coal may become shelly and the sales department of the owning or leasing company may want to reduce the proportion of such flat materials; ash content or

At Merriam stripping—diesel-driven dragline with 110-ft. aluminum boom and 3½-cu.ft. drag bucket lifting overburden from trench on left and spoiling it on right; drills in rear

Same dragline excavator showing bucket being drawn up scraping face ready to be lifted from the ground and swung over to the spoil dump on the right. Air compressor to right of dragline.

fusing temperature of the ash may change either in the pit coal or in the coal with which the pit coal is blended, and the quantity of the pit coal mined daily may have, therefore, to be decreased or increased. In any case, this flexible arrangement is desirable. But this method of operation is not so well suited to conditions where the coal has not been worked already below the outcrop, for water falling into the pit cannot be removed as expeditiously as it can be where there are mine workings to receive it.

A railroad switch has a limited capacity, hence only one excavator can be placed on a working face. Rolling stock also is not easy to bring in over the highways. With all the uncertainties of strikes and closed breakers, it is well to have a minimum of equipment that will be laid idle from these causes and to have units that can be transferred readily to points where they are needed.

In the Merriam stripping, as more coal has been needed than the draglines could uncover and load promptly, if working alternately on stripping and coal loading, a small shovel has been taken down into the trench dug by the draglines and is digging out coal and loading it into trucks, leaving to the adjacent dragline (located in a spot with more than normal cover) only the work of dealing with overburden. As the gradient leading up out of the trench is unusually steep, the trucks are being assisted by a bulldozer, which with its blade lifted pushes the rear of the truck up the steep pitch. This, however, is merely for emergency operation to meet the need of the breaker for more coal.

When cutting in rock, the slope from berm to coal is made 60 deg. In cutting into clay or into old, fairly consolidated dumps an inclination of 45 deg. is provided. New dumps where the material is still loose must be cut at a slope not to exceed 32 or 35 deg. The spoil after excavation occupies about 50 per cent more space than before being distributed.

At this point, depth of stripping being abnormal and dragline with 110-ft. boom and 3½-cu.yd. bucket being delayed in operation, a 1¼-cu.yd. dipper shovel has been put in pit to dig coal loading in trucks. Note footwall on left. Slope on right, 60 deg.

Where the line of the edge of the berm is so far from the bottom of the excavation that the drills would sink their holes too far from the toe of the slope, the berm has itself to be lowered to a level that enables the drills to be placed effectively. This is a matter that must be determined by cross sections.

During 1934 and 1935, the Rhoads Contracting Co. was loading, for the Stevens Coal Co., material from the old Righter breaker coal bank on the property of the Lehigh Valley Coal Co., near Mt. Carmel. This operation was described in *Coal Age* in January, 1935, pp. 28–29. All this bank material has been removed and the 30-ft. Mammoth bed below it is now being extracted by stripping. The breasts made in it were unusually narrow, for the covering rock was thin and weak, and the heavy bank of breaker refuse laid a burden on the area being mined that made the leaving of wide pillars imperative. More of the coal might have been extracted had the workings not been made unbearably warm by the body of bank refuse above them.

Accordingly, the coal, though not virgin when stripping commenced, was found to be most conservatively mined. All the coal is now being extracted by stripping, and what was once a mountain of breaker refuse is now a gash in the flood plain of Shamokin Creek. Here, as the coal is at the bottom of a basin and thus level, a 2-cu.yd. shovel is working in the pit removing overburden and coal, and placing them in trucks which haul them to the surface and to the cleaning plant respectively.

Another big breaker bank—the Belmore—in the same area is being removed for the Stevens Coal Co. and it operates with a trussed conveyorway supporting a 36-in. x 200-ft. belt, equipment originally used in loading the Righter bank. At the latter operation 500 ft. of conveyorway was at one time in operation. The conveyor is loaded by shovel and dumps into railroad cars.

Some Blocks Weigh a Ton

At the Righter stripping a small field preparation plant has been provided consisting of an electrically driven shaking table for picking. Here the rock is taken off and carried to one side by a shaking chute similarly driven. The coal thus divested of its large rock passes to rolls and thence to railroad cars and is shipped to Cameron breaker, at Shamokin, Pa. As the coal at this stripping is unusually blocky, some of the blocks of coal as delivered by the dragline exceed a ton in weight. These are broken by driving a bar into them with a wedge, for they are altogether too large to break on the rolls.

At William Penn Shaft of the Susquehanna Collieries Co., the Rhoads Contracting Co. by open-pit methods is extracting a large area of Mammoth bed coal 30 ft. thick extending under the breaker and railroad switches. Unfortunately, near the

outcrop is about 10 ft. of silt and alongside is the foot of a big rock bank, ready to slide if its footing is disturbed. Some of the actual outcrop has been removed so that where the attack on the coal is made the cover under the silt is about 30 ft. Such a hole, especially in wet weather, is quite dangerous, but, with the dragline excavator on the surface, men need to descend only to shoot the coal, on which mission they are lowered by ropes.

After a storm the hole may well fill with detritus, but the electric dragline excavator with its 110-ft. boom can clean the hole if a landslide occurs. The bucket used is of 3 cu.yd. capacity in lifting overburden and is changed to 4 cu.yd. for the lifting of coal. In addition there are two other machines on this operation, one a dragline with a 70-ft. boom and a 2-cu.yd. bucket, the other a shovel with a 2-cu.yd. bucket. The depth of the excavation—coal and overburden—will run from 150 to 180 ft.

At Mahanoy City plant of the Lehigh Valley Coal Co., the Rhoads Contracting Co. has an electric dragline with a 150-ft. boom and a 10-cu.yd. bucket, which latter is too large for filling trucks and is displaced by a 4-cu.yd. bucket when such work has to be done—an operation taking about 20 minutes. Thus, one dragline is able to perform both functions efficiently.

COMPACT RESCREENER

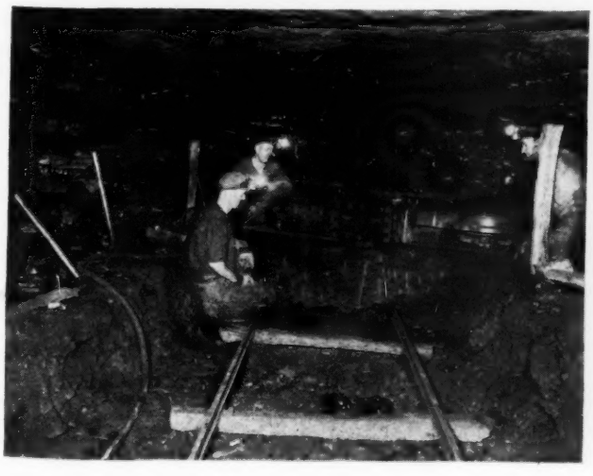
+ And Ring Power System Underground Added at Sunshine No. 3 Mine

OPERATING in the 30-in. Mystic seam in the Centerville longwall field of Iowa, the Sunshine No. 3 mine of the Sunshine Coal Co., Centerville, employs a ring-type distribution system for delivering power to the cutting machines and recently was equipped with a rescreening and oil-treating plant for the production of stoker coal and other junior sizes. The mine was opened on the advancing longwall plan in 1931, and by April 5, 1936, had been advanced approximately 1,200 ft. in each direction from the shaft bottom, the face at that time forming the almost perfect circle shown in Fig. 1.

The ring-type distribution system, adopted to raise the voltage at the face, went in in 1935 and the rescreening plant followed in 1936. Shortly before this article was written, the No. 3 workings had nearly reached those of the No. 2 mine of the company to the west, and preparations were under way to break up the remainder into two segments for further advance.

Cover over the coal at No. 3 is 120 ft. thick. The Mystic seam, showing probably the least variation in thickness and quality of any bed in Iowa, dips southeast 2 to 3 ft. per mile. Local dips or rises are infrequent. The bottom consists of 14 in. to 2 ft. of fireclay. About 1 ft. above the floor is a 1- to 2-in. fireclay parting, which is character-

Cutting across end of entry in Sunshine No. 3 mine



Loaded cars on the bottom at Sunshine No. 3

istic of the seam. This parting, however, is readily broken free from the coal as it is mined and consequently can be completely removed as the coal is loaded. Over the seam is a black slate 6 in. to 2½ ft. thick, followed, as a general rule, by 6 in. of clod. Next is the persistent "cap rock" (limestone), 6 in. to 2 ft. thick, normally overlaid by 5 to 6 ft. of limey shale. The remainder of the overburden consists of shales and sandstones, including the characteristic "18-Ft." and "50-Ft." rocks, so called because they lie 18 and 50 ft., respectively, above the seam. The "18-Ft." rock is about 3 ft. thick and the "50-Ft." about 5 ft. thick.

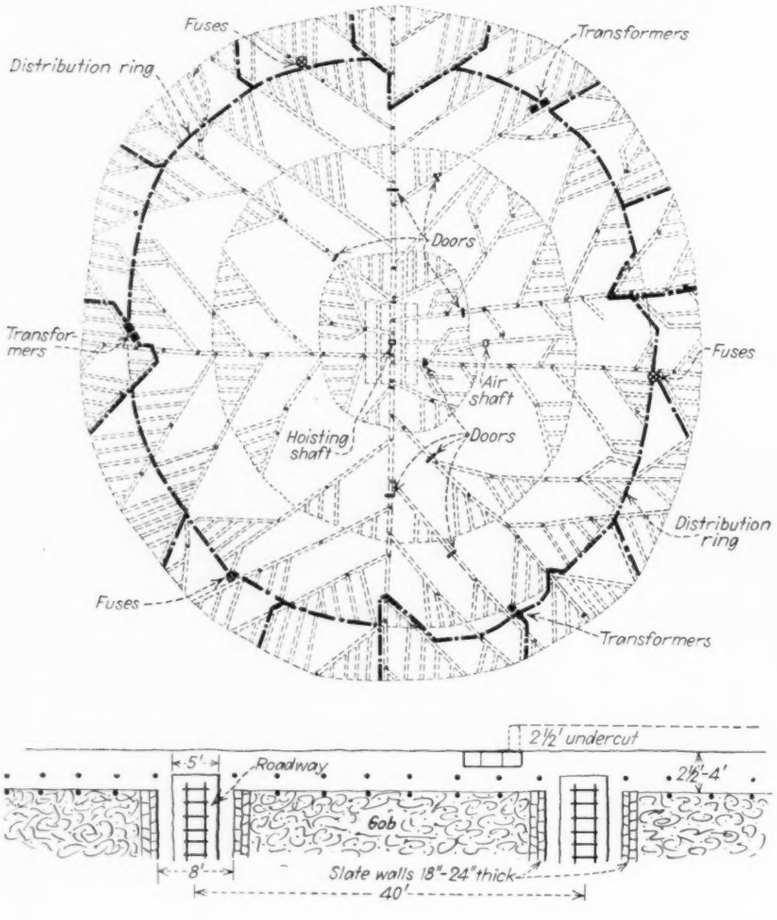
Fig. 1 shows the general plan of development and the working places as they appeared at the time of the annual survey on April 5, 1936. From the shaft bottom, which is protected by solid pillars of coal, single main entries run north, south and west. Two main entries are driven to the east, in which direction the intake air is routed to the face, where it divides to the right and left and flows around the circle to the return, which is from the west to the hoisting shaft. From the main entries, subsidiary room entries are turned right and left at angles of approximately 60 deg. These right and left entries are spaced the proper distance to give a room depth of approximately 125 ft., but, as a general rule, not more.

Rooms approximately parallel to the main entries are turned off the right and left entries on 40-ft. (standard) centers. These rooms and the various entries provide access to the face, each such opening serving approximately 40 ft. Entries and rooms are extended a corresponding distance with each advance of the face, and as a right or left entry cuts off a room on the entry behind it, a new room is turned to take its place.

All entries and rooms naturally are made in territory from which the coal has been completely extracted, with the result that the roof has settled on walls and gob to within about 12 in. of the floor. Height in entries is secured by taking down top and lifting bottom, and in rooms, which ponies are not required to enter, by lifting bottom. In either case, the depth of bottom lifting and the height of the top brushing, or of the former alone in rooms, is adjusted so that the total height after settlement of the roof is sufficient to permit ponies or cars and men to enter. Except where bad spots, which require support, appear in the roof, no timber is used in either entries or rooms.

Standard width of all openings is 8 ft. from rib to rib. Width of the roadway in which the track is laid, made by taking up the fireclay down to the rock beneath—a matter of 14 in. to 2 ft.—is 5 ft. As entries and rooms advance, walls 18 to 24 in. thick are built on each side, using, as a general rule, the black roof slate. (In entries, all material is taken down to the cap rock.) The space between the walls is filled (Fig. 1) with dirt from the undercut (made in the fireclay), material yielded by the bottom-lifting and top-brushing operations, and miscellaneous refuse. Usually, the refuse yield is sufficient to fill completely the interval between walls. Any material which cannot be used in this fashion is loaded into cars for disposal on the surface.

Fig. 1—Sunshine No. 3 mine workings on April 5, 1936, showing places active at that time and location of the power-distribution ring and laterals. Details of walls and gobbing appear in the lower sketch



Three-Man Crews on Machines

Undercuts are 2½ ft. deep and, as noted above, are made in the fireclay under the coal, using one Sullivan CLE-2 and three CLE-5 longwall machines making 5-in. kerfs. These machines are driven by 50-hp. motors. One machine is double-shifted, and in operation the machines follow each other around the face. The bulk of the cutting, however, is done after 3 p.m. each day. Three-man crews are employed, and crew members also set sprags to keep the coal from breaking down and rolling out of the face and place any timbers which may be necessary. The interval between a section of the face after it is cleaned up and the packwall usually varies from 2½ to 4 ft. and, where it is more than the 2½ ft. required to clear the machine, posts 3 in. in diameter at the small end, or their equivalent, are set by the miner on about 5-ft. centers, or less if the condition of the place dictates it. Any other timbering necessary to make the place safe also is expected of the miner. When safe to do so,

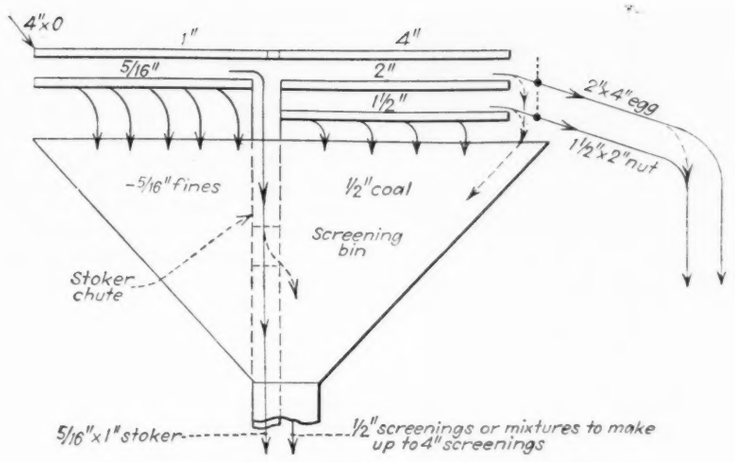


Fig. 2—Coal flow over the rescreening-plant vibrator

posts are recovered; otherwise, they are left in place.

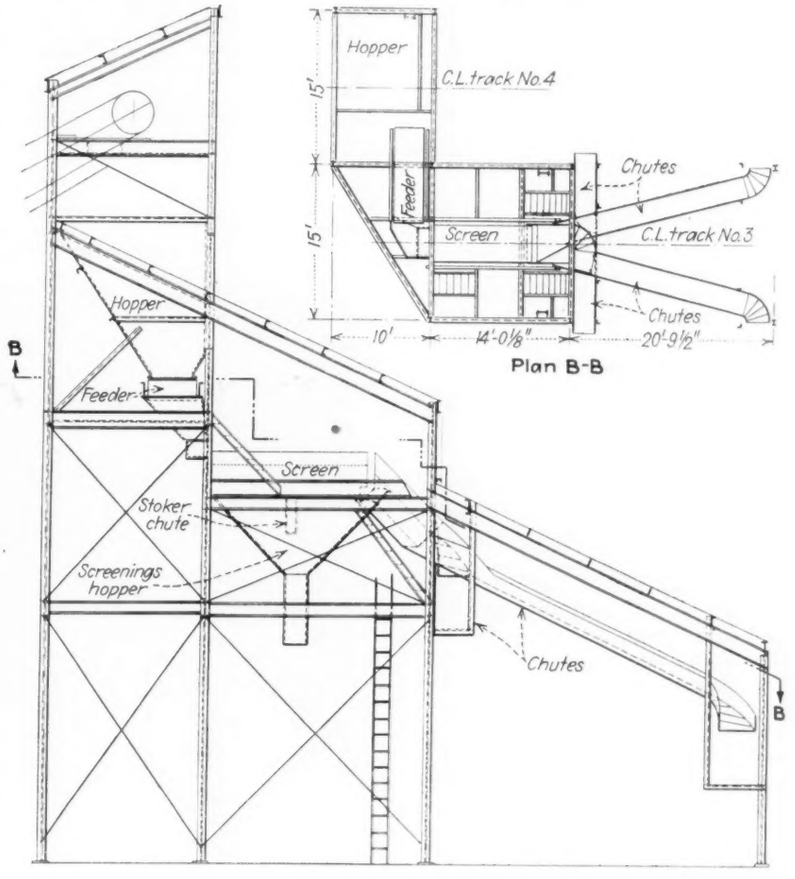
Each miner is assigned a definite room, or "home place," serving, as stated, about 40 ft. of face. The miner's first task is cleaning out the undercut and the floor in front of the face, throwing cuttings and other refuse into the gob behind the slate walls along the entry or room. Then, starting with the section below the fireclay parting, he picks and wedges down the coal, timbering as necessary as the work progresses. Taking out the bottom bench first simplifies the job of completely removing the parting. No explosives are used and consequently the coal usually comes down in big chunks, which are rolled out to the car. Such fine coal as is made is turned once or twice if necessary to get it to the roadway. After the coal is loaded, the roadway in the bottom of the room or entry is extended by digging up the fireclay. This task is not included in the mining rate. Roof breaks to the surface are secured after each cut is removed. Subsidence of the roof down to within about 12 in. of the floor usually is complete within 100 to 150 ft. of the face.

Ponies or small mules 40 to 48 in. high are used to haul the coal in Timken- and Hyatt-equipped cars 14 in. high. As loaded, car capacity averages 1 ton. Track consists of 25- and 12-lb. rails on wooden ties. Normally, five spike teams and two single ponies are employed in hauling the average daily output of 600 to 650 tons. The total mine force for the same output normally includes about: 130 loaders, fifteen machinemen, seven drivers, two tracklayers, two cagers, seven top men, one engineer, company men and face boss.

Power originally was supplied the cutting machines from a transformer station on the surface through a cable down the quarter shaft and cables and bare wires out the entries to the face. As mining proceeded away from the shaft, the transmission distance increased, with a corresponding drop in voltage to around 160 to 180 instead of the standard of 220 at the mining machines. Consequently, the present ring system was proposed early in 1935 by L. W. Breese, Iowa Southern Utilities Co., who investigated the problem at the request of J. R. Hamm, president of the Sunshine Coal Co. The ring system is patterned after general practice in city distribution systems, in which voltage is maintained and transformer capacity is reduced by hooking several transformer stations, at strategic points, into the same circuit so that the distance between any two stations is not in excess of that necessary for voltage maintenance. Transformer capacity in any one station can be less than the maximum load which might be concentrated at a near-by point, as current in excess of the station capacity can be supplied by the others. At Sunshine No. 3, another factor was reduction in the footage of cable required, as compared with distribution from the shaft bottom.

Location of the underground 220-volt distribution ring at No. 3 is shown in Fig. 1. The ring circuit is made up of rubber-insulated braid-covered cable with 2/0 wires. This cable is threaded through 2-in. steel pipe for protection, inasmuch as the

Fig. 3—Plan and side elevation of rescreening plant, Sunshine No. 3



Rescreening at Sunshine No. 3 is done on this horizontal vibrator

ring necessarily is semi-permanent in character and consequently was soon left behind in the gob as the face advanced and the roof subsided. Where the ring crosses a permanent roadway, however, the pipe is omitted and the cable merely passed under the track. In addition to the protective feature, it is expected that installation in the pipe will permit recovery of much of the cable in the future. From the ring, laterals 500 ft. or less apart are run to the face. Joints between laterals and the main cable are made by soldering the conductors and wrapping with tape. Miller connectors are used to make the connections between the laterals and the 300-ft. machine cables (No. 2 wires).

The ring circuit receives power at 240 volts (no load) from three 2,300/240-volt transformer banks located at the bottom of three 2-in. boreholes. Two 25-kva. transformers make up each bank and the six transformers in service permit combinations to provide the necessary three phases. On the surface, 2,300-volt pole-line circuits from the main transformer station at the shaft serve each borehole. Power is taken down the boreholes by armored (first two holes) and Trenchlay cables (No. 6 wires). Fused cutouts (25-amp. fuses) are installed on the high-tension side of each pair of transformers, with three-pole knife switches on the distribution side. Later, it is expected that one additional transformer will be added to each bank to bring the total up to three at each borehole.

About midway between each pair of transformer banks is a fuse box with 150-amp. fuses in each phase of the circuit. These fuse boxes enable other sections of the ring to operate when trouble is encountered in one. To date, however, such interruptions have been very few. In case trouble is encountered in a section, two fuse boxes and the cutout fuses blow, isolating this section from the other two until the difficulty can be attended to.

The original Sunshine No. 3 tipple was equipped with shaker screens and a pick breaker for making, as a rule, 4-in. screenings, 4x8-in. furnace, and 8x16-in. lump. By changing screen plates, corresponding variations in these sizes are possible. An auxiliary single-roll crusher also was installed to break down the entire coarse-coal output or all coal from furnace down when market conditions warrant it. When loading lump and crushing the remainder, the furnace is carried back to the crusher by a scraper conveyor installed under the main shakers and on the same center line. This conveyor also is used to return degradation from the lump and furnace sizes to the screenings bin by closing the gate over the crusher and also can be used to bring back furnace to load a minus 8-in. resultant from the same bin. The auxiliary crusher also is used at the present time in breaking down large coal for transmission to the rescreening plant when calls for junior sizes, particularly stoker coal, make this step desirable.

As the miners are paid on the screened-lump basis, the main shaker screens are preceded by a bar-screen section with $1\frac{1}{4}$-in. openings. Fines through the bar screen drop into the screenings bin. From the weigh basket the plus $1\frac{1}{2}$-in. coal is discharged onto the upper shaker, fitted with a screen section having 4-in. round perforations. Coal through these openings joins the minus $1\frac{1}{4}$-in. fraction in the screenings hopper. A gate just ahead of the screening section, however, permits bypassing the entire plus $1\frac{1}{4}$-in. fraction to the auxiliary crusher when desired.

A view of the face after it has been cut. Part of the coal has been pulled down immediately in front of the camera. The slate wall on one side of the room appears at the left, with gob behind it

Between the upper and lower shakers the plus 4-in. coal passes under a coal-company-designed pick breaker consisting of two rows of steel points about 12 in. long on 10-in. centers set in a frame pivoted at one end. At the other end, on the opposite side of the flat-apron conveyor which carries the coal under the points, an arm attached to a crank gear moves the breaker up and down on the pivot shaft. Operation of the conveyor is intermittent.

How Conveyor Operates

This intermittent conveyor operation is made possible by a make-and-break switch in the conveyor-motor circuit. On the upward stroke of the breaker, the frame strikes the switch-contact lever, starting up the motor and moving the conveyor forward. As the breaker starts on the downward stroke, the circuit to the conveyor motor is broken, stopping the conveyor while the pick points pierce the lumps, which not uncommonly run up to 300 lb. or more in weight. Speed of the conveyor is adjustable to permit varying the maximum size to which the lumps are broken. Running the conveyor faster, which means moving the coal forward more each time, increases the maximum size of the coal after breaking.

Coal from the breaker conveyor falls onto the lower shaker, equipped with a screening section with 8-in. perforation for making 4x8-in. furnace, which, after passing over a degradation screen, goes either to an open-top car or to an Ottumwa box-car loader. One section of the degradation screen also serves as a gate to bypass the furnace to the scraper conveyor noted above for transmission to the auxiliary crusher. Lump over the screening section of the lower shaker goes either to an open-top car or an Ottumwa loader. Standard loading is: lump, No. 1 track, box or open-top cars; furnace, No. 2 track, box or open-top cars; and screenings, No. 3 track, open-top cars.

Growth in the use of domestic stokers, with a corresponding increase in the demand for stoker coal, as well as for other smaller sizes, was met by the installation of a rescreening and oil-treating plant at No. 3 in 1936. The rescreening plant is located 100 ft. west of the original tipple and is served by a scraper conveyor installed on a pitch of 30 deg. Minus 4-in. coal is chuted to a small feed hopper at the ground end of the conveyor under the main tipple. In the rescreening plant, this coal is discharged into a small storage hopper, from which it is removed by a short apron-type feeder which discharges it onto the sizing screen.

Rescreening at No. 3 is done on a 3x10-ft. triple-deck horizontal-type Nordberg-Symons vibrator. The feed end of the upper deck is fitted with wire cloth for separating out the minus 1-in. fraction (see Fig. 2), which drops onto the second deck. On this deck, the 5/16-in. fines are taken out, dropping directly into the screenings bin over the No. 3 track. Stoker coal (1x5/16-in.) made on this deck is discharged into a chute built down into the screenings bin and then out to one side to a flexible discharge pipe to the No. 4 track. This No. 4 track, however, does not extend to the main tipple. By means of a gate in the stoker chute, this size also may be bypassed into the screenings bin to make a 1-in. screenings.

The discharge end of the upper deck of the vibrator is equipped with wire cloth for making a separation at 4 in. of the coal over the 1-in. cloth on the feed end. The 4-in. cloth, however, is installed only for emergency use, as 4x8-in. coal normally is made in the main tipple. On the second deck at the discharge end, a 2x4-in. egg is made and on the third deck a 1½x2-in. nut. Coal through the lower deck (½-in.) drops into the screenings bin and combines with the 5/16-in. fines to make ½-in. screenings. From the discharge end of the vibrator, a system of four chutes permits a choice between four loading points for the nut and egg, two on the No. 2 and two on the No. 4 track. Nut is loaded on one track through one of the two chutes, and egg similarly on the other.

Box-car shipments of egg usually are loaded on No. 2 track by an Ottumwa loader. A portable belt-type Ottumwa loader also can be used to load box cars on No. 4 track, if desired. Screenings are loaded only on No. 3 track and stoker only on No. 4. The stoker chute is located far enough upgrade to permit two cars to be spotted for loading at once on No. 4 track. Gates in the egg and nut chutes permit making a combination of these sizes on either the No. 2 or No. 4 track, usually the former when box cars are to be loaded. Also, additional gates permit running the 1½x2-in. nut or the 1½x2-in. nut and 2x4-in. egg in the screenings bin to make either a 2- or 4-in. screenings. It will be noted that while a total of six chutes are provided, only four sizes can be loaded by the rescreening plant at a time, as two of the chutes are alternates for others. In case minus 8-in. coal is brought to the rescreener in an emergency, which would mean the production of five sizes on the screen, two of the nut, egg and furnace sizes would be combined into one.

Dustless treatment of any or all sizes except ½-in. screenings is made possible by an installation of the Viking hot-oil-vapor process. As all sizes from stoker up are loaded through open-topped chutes, hoods, each with a single spray nozzle, are placed in each chute so that the spray is directed down on the coal as it tumbles along in the chute bottom.

Sunshine No. 3 rescreening plant, with the main tipple in the background.

MINE SUPPLY COSTS

+ At Bituminous Operations in 1935

Close to 1929 Average per Ton

By F. G. TRYON
W. H. YOUNG
and F. E. BERQUIST[1]

IN 1935 the bituminous coal industry spent $73,704,997 for mine supplies, an average cost of $0.198 per ton for coal produced. The average for 1929, according to the Bureau of Census figures, was 20c. In 1937, at the same cost per ton and at the rate of production attained during the first four months of the year, the annual supply bill will approximate $82,600,000. In 1935 the industry's bill for purchased electric power was $25,080,359, and payments in wages were $402,700,000.

These figures are a byproduct of the Works Progress Administration's National Research Project on Reemployment Opportunities and Recent Changes in Industrial Technique. The Bureau of Mines is cooperating in this project with a study on the trends of mining technology and output per man. The primary purpose of the study is to throw light on the prospects of reemployment, but a necessary first step has been to build a trustworthy record of the number of jobs below ground, the mechanical equipment of the mines, and their requirements in supplies. It is realized that the operations of mining itself give rise to thousands of other jobs in the provision of explosives, timber, steel products, wire rope, lubricants, and the hundreds of other items that make up the supply bill of the typical mine. The information summarized in this article was collected through a supplementary question on the Bureau of Mines' annual report form in connection with a cooperative agreement with the 1935 Census of Business.

The table gives the 1935 supply bill of the soft-coal industry, by States and major subdivisions. West Virginia led all other States in total purchased, with expenditures of $17,119,874 for supplies, slightly exceeding the Pennsylvania bituminous industry, which reported $16,890,449. If anthracite were included, however, the Keystone State would show a commanding lead. At the 1929 census, the Pennsylvania anthracite region reported purchasing $43,367,000 in supplies. Separate figures for anthracite in 1935 are expected shortly.

Fully two-thirds of the bituminous industry's supply bill is concentrated in the territory of the Appalachian conference. But while the Appalachian area remains the largest outlet, per-ton expenditures for supplies are higher in the Mississippi Valley and the Far West.

Expenditures for Supplies, Fuel, and Purchased Electric Power at Bituminous Coal Mines in 1935

(Exclusive of Alaska and of wagon mines producing less than 1,000 tons a year)

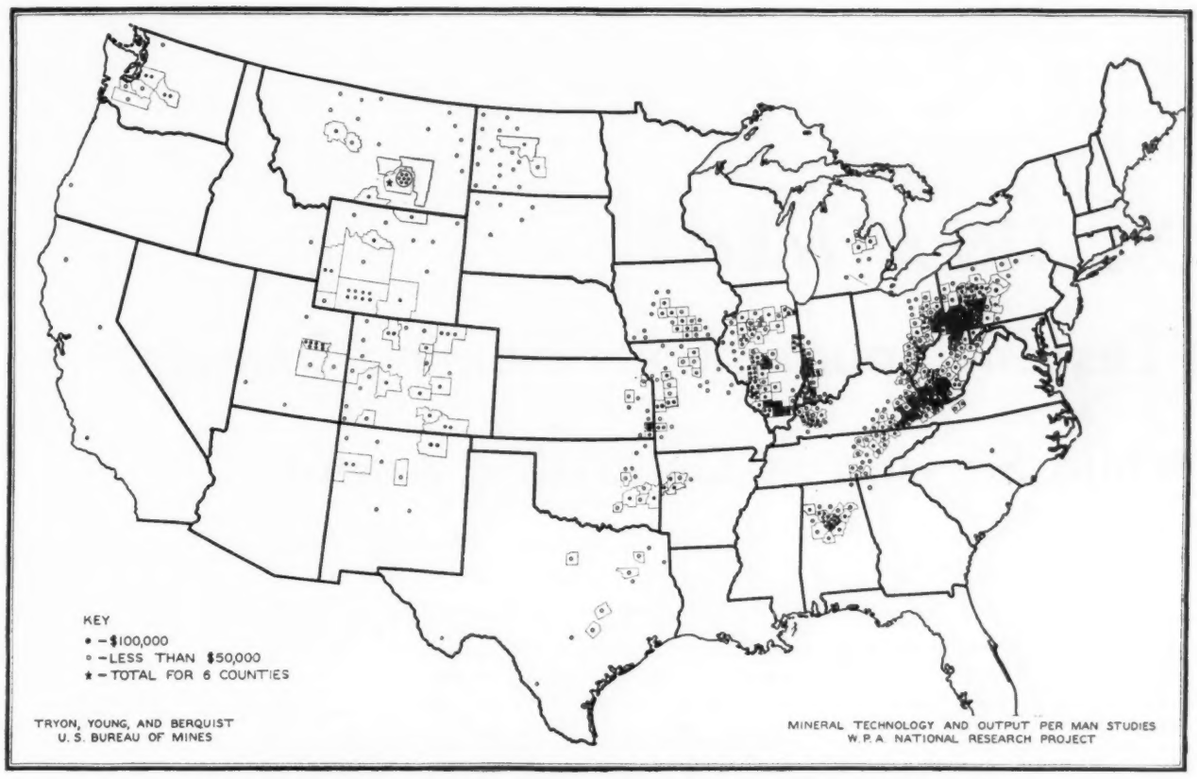
State	Total Expenditures (In thousands of dollars)			Per Net Ton			
	Supplies and materials [a]	Colliery fuel	Purchased electric power	Supplies and materials	Colliery fuel	Purchased electric power	Total supplies, fuel and power
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Alabama	$ 2,206	$ 120	$ 880	$0.259	$0.014	$0.104	$0.377
Arkansas	403	20	188	.356	.017	.166	.539
Colorado	1,324	213	501	.224	.036	.085	.345
Illinois	10,041	878	2,346	.225	.020	.053	.298
Indiana	3,990	307	877	.253	.019	.056	.328
Iowa	805	73	276	.220	.020	.076	.316
Kansas	700	15	254	.261	.006	.094	.361
Kentucky:							
Eastern counties	6,168	254	1,975	.189	.008	.060	.257
Western counties	1,228	114	383	.151	.014	.047	.212
Maryland	311	14	93	.185	.008	.056	.249
Michigan	272	76	66	.433	.121	.105	.659
Missouri	1,106	34	381	.303	.009	.105	.417
Montana	938	6	147	.340	.002	.053	.395
New Mexico	421	63	105	.303	.045	.076	.424
North Dakota	369	24	121	.189	.012	.062	.263
Ohio	3,865	208	1,211	.183	.010	.057	.250
Oklahoma	362	24	110	.295	.020	.089	.404
Pennsylvania:							
Eastern counties	6,845	664	3,015	.196	.019	.086	.301
Western counties	10,046	608	4,004	.178	.011	.071	.260
South Dakota	3	c	....	.231	....	....	.231
Tennessee	775	69	277	.187	.017	.067	.271
Texas	87	6	16	.115	.008	.021	.144
Utah	709	8	333	.240	.003	.113	.356
Virginia	1,783	31	667	.185	.003	.069	.257
Washington	501	30	185	.321	.019	.119	.459
West Virginia:							
Northern counties	3,593	177	1,357	.152	.007	.057	.216
Southern counties:							
High Volatile [b]	4,167	56	1,682	.157	.002	.063	.222
Low Volatile [b]	9,360	595	3,210	.192	.012	.066	.270
Wyoming	1,312	106	420	.254	.020	.081	.355
Other States	15	3	c	.313	.062	....	.375
Total	$73,705	$4,796	$25,080	$0.198	$0.013	$0.067	$0.278

a Includes cost of lumber and timber, iron and steel materials, explosives and oil used directly or sold to employees, water for boilers, machinery supplies and all other supplies and materials necessary to maintain and operate the mine.

b For statistical convenience the classification is by counties and all of Fayette County has been included with the low-volatile group, although much of its output is high-volatile.

c Less than $500.

[1] Published by permission of the Director of the Works Progress Administration, National Research Project, and the Director of the U. S. Bureau of Mines.


KEY
• – $100,000
◦ – LESS THAN $50,000
★ – TOTAL FOR 6 COUNTIES
TRYON, YOUNG, AND BERQUIST
U. S. BUREAU OF MINES
MINERAL TECHNOLOGY AND OUTPUT PER MAN STUDIES
W.P.A. NATIONAL RESEARCH PROJECT

Distribution of the market for mine supplies in bituminous coal production, 1935

Each black dot represents the purchase of $100,000 of supplies and materials in 1935. Circles represent purchases of less than $50,000 in the counties of smaller production. Boundaries of the more important counties are shown.

Against an average of 17.3c. in West Virginia, per-ton supply costs in Illinois were 22.5c., in Indiana 25.3c., and in Wyoming 25.4c. In large part these higher ratios reflect higher degrees of mechanization, either underground or in strip mining, but in part also they reflect differences between shaft and drift mines or local variations in timber costs.

Highest of all in per-ton supply costs are some of the smaller States where mining conditions are abnormally difficult or the proportion of stripping is exceptionally high. In many areas these per-ton ratios are to be considered approximate only, since the returns obtainable by a general census cannot hope to reach the accuracy of cost-accounting methods. But while the comparisons are not precise, they serve to bring out the broader relationships.

Another sign of mechanization is the increase in the industry's power bill. Expenditures for purchased electric power have increased from 2.5c. per ton in 1919 to 5.7c. in 1929 and 6.7c. in 1935. In a measure, of course, this increase reflects the shutting down of isolated steam plants at the mines, and the shift to central-station power, especially between 1919 and 1929, but in part also it indicates the trend toward electrification and toward increasing horsepower per man employed.

The distribution of the mine supply bill by counties is shown in the accompanying map. McDowell County, West Virginia, heart of the Pocahontas field, led all other counties in 1935, with an expenditure of $3,272,986. This one county purchased more mine supplies than many entire States, and in the map where one black dot represents an expenditure of $100,000, the county appears as solid black. Other areas of maximum density of concentration are Fayette, Raleigh, and Logan in southern West Virginia; Marion in northern West Virginia; Cambria, Somerset and Indiana counties in eastern Pennsylvania; Allegheny, Washington, Fayette and Westmoreland in the Pittsburgh district; Franklin and Christian counties, Illinois; Harlan County, Kentucky; and Jefferson County, Alabama. Each of these counties reported over $1,000,000 spent for supplies in 1935.

At the other extreme stand numerous counties in which the annual supply bill is less than $50,000 and is, therefore, too small to be represented by a single black dot. These cases are indicated by the open circles on the map. Production of some counties is so small that county boundaries are not shown, that distinction being reserved for more important counties. Each circle, however, represents a center of coal-mining activity and a potential market for the purchase of mine supplies.

At the 1929 census, operators were asked for the value of new machinery purchased, and reported expenditures for that purpose of $34,947,000. The 1935 canvass related only to consumable supplies, but the regional distribution of the supply bill may doubtless also be taken as rough indication of potential markets for capital equipment.

Attention is called to these county statistics because of their possible interest to the makers and distributors of mine supplies. Manufacturers may find them useful in scheduling production, and sales managers in seeking more efficient distribution. Detailed tables are being issued giving these items for each county, and the complete series covering all counties in the 24 important coal mining States will shortly be available.[2]

[2] Works Progress Administration, National Research Project, "Employment and Related Statistics of Mines and Quarries —Part I, Bituminous Coal," by F. G. Tryon, M. E. Wilson, W. H. Young, and F. E. Berquist.

OIL TREATMENT

+ Lessens Spontaneous Heating Dangers While Serving as Dedusting Agent

By H. A. AMBROSE
and H. J. R. GASPARI

Research and Development Division
Gulf Oil Corporation

ALTHOUGH spontaneous heating of coal and its consequent combustion have been studied since about 1845, little attention has been accorded to methods of prevention other than those relating to mechanical condition of coal in storage. Treatments with chemical solutions have been suggested, but these are more successful in allaying dust than in preventing spontaneous combustion.

Proposed physical methods for reducing the tendency to spontaneous heating include: (1) virtual absence of air in storage; (2) packing of coal so tightly that admission of free air will be reduced to a minimum; (3) provision of sufficient ventilation to cool interior of pile; (4) grading of coal with elimination of fines; and (5) submergence in water. Although all these methods have merit, none has been widely practiced.

Value of Oil Sprays

Spraying coal with oil for dedusting is a relatively modern development. Oil spraying improves coal in several ways: (1) Eliminates 70 to 90 per cent of objectionable dust from fines when properly applied; (2) decreases spontaneous combustion or tendency to fire in piles; (3) minimizes absorption of moisture; (4) minimizes freezing during transit or in storage; (5) facilitates movement and prevents arching in bins, bunkers, chutes, stokers, etc.; (6) decreases degradation in handling; (7) does not corrode metals with which it comes in contact.

The effects of oil on spontaneous combustion have not been publicized largely because definite experimental evidence is lacking to corroborate favorable evidence in actual service. Experimental methods for determining decrease in heating are relatively simple, however, and are particularly of value when selecting proper oils for application to coal.

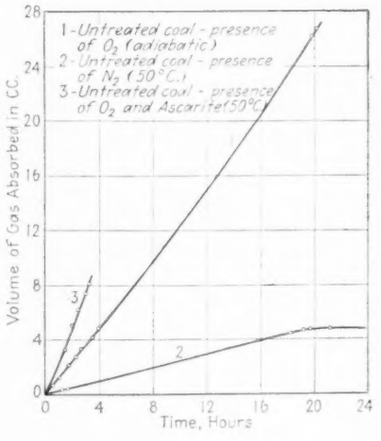
Cause of Self-Heating

This is not the place for an extended discussion of the mechanism by which coal heats spontaneously. An enormous number of papers have been published on this subject; those up to 1928 are accurately summarized by Davis and Reynolds.[1] Subsequent papers contain additional details as to rates of air or oxygen absorption, ignition temperatures and the chemical mechanism of coal oxidation. Several independent investigators have assigned specific causes for spontaneous combustion, but are not wholly in agreement, doubtless because of complex chemical structure of coal and differences in coals from different localities. In general, without assigning specific causes of oxidation, other than that coal is a chemically reactive material, it may be stated that development of heat results from: (1) absorption of gases, (2) reaction of oxygen with coal to form solid compounds, and (3) reaction of oxygen with coal to form volatile products such as carbon monoxide, carbon dioxide and water.

At temperatures below 50 deg. C. (122 deg. F.) oxygen reacts with coal to form solid products; thus the coal gains in weight. Below this temperature very little carbon dioxide is formed. At elevated temperatures solid compounds either decompose or oxidize further with evolution of carbon dioxide, carbon monoxide and water. As coal is a poor conductor of heat, heat of reaction is not readily dissipated and the temperatures may rise until coal ignites. Both ignition temperature and tendency to spontaneous combustion vary with the grade of the coal and with its state of subdivision.

As stated, heating may be due to a combination of physical and chemical reactions, the latter of which predominate. It is well known that the physical condition of the coal has a large influence upon its rate of heating. The rate of reaction between a gaseous and solid substance is di-

Fig. 1—Apparent absorption of gas by coal



[1] J. B. Davis and D. B. Reynolds; U. S. Bureau of Mines Technical Paper 409 (1928).

rectly proportional to the surface area of the solid exposed to the gas. Considering a cube of coal of any volume, its surface area is equal to $6L^2$, where L is the linear dimension of the cube. The surface area of a 1-in. cube of coal is 6 sq.in. If the 1-in. cube is reduced to 20-mesh (U.S. standard), the aggregate surface area amounts to about $6L^2/L^3$ or $6/L$, where L is the linear dimension of the maximum size cube which will pass a 20-mesh screen. For 20-mesh coal, then, the aggregate surface area approximates 192 sq.in. The surface area of a cube of coal ground to pass a 200-mesh screen is about 2,000 sq.in., 333 times the surface area of the 1-in. cube. Thus the relative surface exposed by finely ground coal is large, accounting for its ease of oxidation. Dust explosions may be due to the large surface area exposed, resulting both in reduced ignition temperature and increased rate of oxidation by flame.

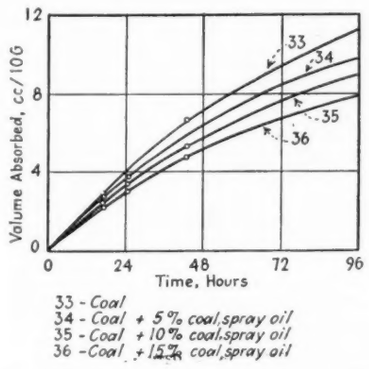


Fig. 2—Absorption of oxygen at 50 deg. C. by coal (through 200-mesh)

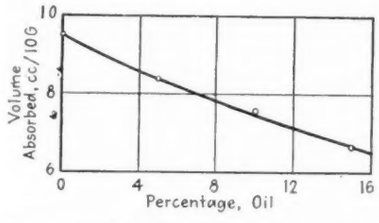


Fig. 2A—Relative rate of absorption of oxygen vs. quantity of oil

Protection of solid fuel against spontaneous combustion by treatment with petroleum oil dates back at least as far as 1906,[2] when Sterne proposed a process of treating lignite with oil or crude petroleum to prevent disintegration. Records show that coal was sprayed with oil commercially more than ten years ago. The advantages of oil spray are manifold, including:

1. Reduction of dusting; one of the main disadvantages of bituminous coal for household use is its tendency to deposit an objectionable coating of coal dust throughout the cellar; this dust nuisance may be reduced as much as 90 per cent by coating coal with petroleum products.

2. Definite reduction of the tendency to spontaneous combustion or heating. The means by which oil prevents heating has been studied carefully in this laboratory, and oils have been developed which will attain the maximum effectiveness.

3. Low cost of spraying and relatively small quantity of oil required to protect coal against heating and dusting.

Oil Acts as a Shield

The mechanism by which oil prevents heating is not chemical but physical. When sprayed on coal, a sufficiently non-viscous oil is drawn into and clogs the capillary pores, retarding the rate at which oxygen is drawn into the interior. No heavy liquid layer need be built up on the coal surface; increments of oil above ½ to 2 gal. per ton for average sizes are of little effect in retarding oxidation. The greatest effect is obtained by the first ½ to 1 gal. of oil. As shown by Galloway,[3] the rate of oxygen absorption is decreased by hygroscopic moisture in the pores (a clogging effect) but not by surface moisture.

To minimize loss by vaporization during spraying, coal-spray oils should be relatively non-volatile. A light distillate with a high rate of volatility is less desirable than a reasonably close-cut distillate relatively low in volatile fractions. Once coal has been sprayed, the volatility of the oil is not of importance, as the motion of air over the oil surface is so restricted under storage conditions as to prevent excessive loss from evaporation, most of which occurs on the outside of the pile, where heating is not a problem. Evaporation is negligible in the interior, which is protected from air currents. Furthermore, the more effective fraction of the oil is absorbed in the pores of the coal and is not susceptible to vaporization by air currents.

Usually, coal-spray oils should have a viscosity of approximately 100 S.U.V. at 100 deg. F., but oils having a viscosity of 200 S.U.V. at 100 deg. F. may be used. The lower-viscosity oils are more desirable because of greater ease in handling, pumping and spraying. They tend to penetrate the pores of the coal more readily than oils of higher viscosity.

As oxidation of coal develops heat, both volume of oxygen absorbed and rise in temperature due to heat of reaction should be considered. Davis and Byrne[4] studied the oxidation

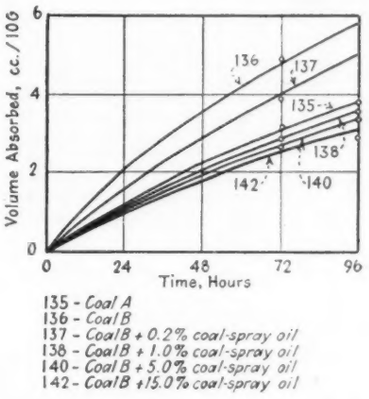

Volume Absorbed, cc./10G
Time, Hours
135 - Coal A
136 - Coal B
137 - Coal B + 0.2% coal-spray oil
138 - Coal B + 1.0% coal-spray oil
140 - Coal B + 5.0% coal-spray oil
142 - Coal B + 15.0% coal-spray oil

Fig. 3—Absorption of air at 50 deg. C. by coal (8- to 10-mesh)

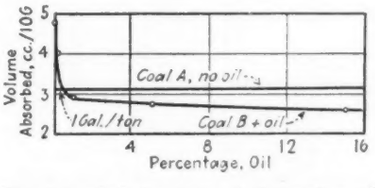


Fig. 3A—Relative rate of absorption of air vs. quantity of oil

characteristics of various coals with an adiabatic calorimeter, following both oxygen absorption and temperature rise. The early part of our investigation was carried out in a similar manner, following the progress of oxidation in a bath so constructed that the temperature of the bath increased with that of the coal, no heat of reaction being lost to the outside surroundings. This bath is described by Weinrich and Gaspari.[5]

Curve 1, Fig. 1, shows rate of apparent oxygen absorption by a sample of coal under adiabatic conditions. The curve is concave upward, as increasing temperature of coal increases rate of reaction. A temperature-time curve is similar in form to Curve 1, rise in temperature being approximately proportional to time. Curve 2 shows apparent absorption of nitrogen by a freshly ground coal sample which had been deaerated by blowing with nitrogen

[2] U. S. Pat. 838,281; Dec. 11, 1906; Louis Sterne.

[3] William Galloway, *Colliery Guardian*, 128, 1000 (1924).

[4] J. D. Davis and J. F. Byrne: *J. Am. Ceramic Soc.*, 7, 809 (1924).

[5] Whitney Weinrich and Hannibal Gaspari: *Ind. Eng. Chem.*, 8, 307 (1936).

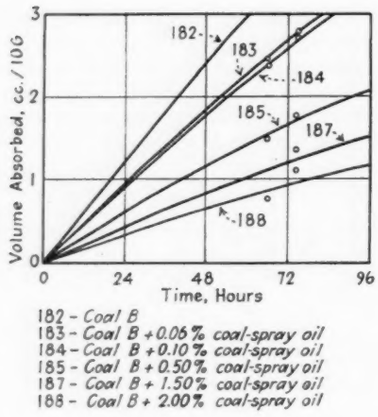


Fig. 4—Absorption of air at 50 deg. C. by coal (8-mesh to ½-in.)

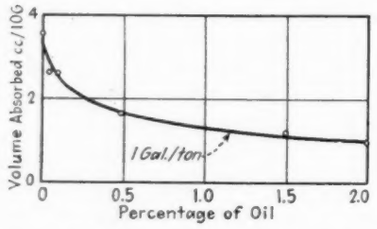


Fig. 4A—Relative rate of absorption of air vs. quantity of oil

before exposure to an atmosphere of nitrogen in the reaction chamber. Apparently the absorption is complete at about 20 hours. Curve 3 shows apparent rate of oxygen absorption in presence of an absorbent (ascarite) for carbon dioxide and water vapor.

Though the adiabatic method of oxidizing coal furnishes complete, accurate information on single samples, it is too cumbersome and slow a method; not readily adaptable to simultaneous study of a large number of samples. It is difficult to duplicate results unless several samples of coal ground from a single batch and well mixed to obtain similar specimens are observed concurrently. For an accurate comparative study of the effect of various proportions of oil on coal, each sample should be similar in both physical and chemical properties to every other and prepared under the same conditions. Chemical composition and reactivity vary greatly from one piece of coal to another. All comparative tests should be performed simultaneously on samples taken from a batch of coal ground and graded to the desired mesh, and then well mixed.

To obtain rapid comparative results, a method was devised in which the coal samples were thermostated and the apparent rate of air or oxygen absorption was measured by decrease in pressure on a mercury manometer directly connected to each reaction vessel. A similar apparatus was used by Bunte and Brückner.[6] In brief, the method was as follows: A lump of coal was ground and sieved to the required mesh. Fifty-gram samples were placed in 250-ml. Erlenmeyer flasks sealed with a rubber stopper through which was fitted a mercury manometer tube for measuring drop in pressure, and a straight tube for pressure equalization. When the gas in each flask had come to bath temperature, the straight tube was sealed and the reaction proceeded. Manometer pressures were corrected for barometric changes and calculated to apparent volumes absorbed.

Figs. 2 to 4A show the experimental results obtained for coals of different sizes coated with various quantities of coal-spray oil. Fig. 2 shows the apparent volume of oxygen absorbed by 200-mesh coal as a

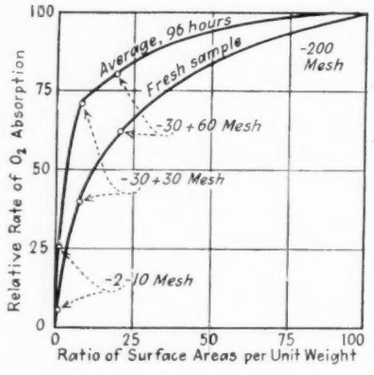


Fig. 5—Relation between size and rate of oxygen absorption

function of time and of the proportion of oil. Fig. 2A shows the volume of oxygen absorbed in 72 hours as a function of percentage of oil by weight of coal. It is important to note that the rate of oxidation of 200-mesh coal is only moderately affected by oil even in proportions as high as 15 per cent by weight of coal.

Figs. 3 and 3A illustrate the relative rates of reaction of coal with air, comparing Coal *A*, known to be relatively free from heating in storage, with Coal *B*, which heats excessively in storage. Approximately one gallon of coal-spray oil per ton is required to reduce the oxidizing tendency of the Coal *B* to that of the Coal *A*. The reduction in relative rate of absorption for 8- to 10-mesh coal (1 gal. of oil per ton) is approximately 35 per cent, as against 48 per cent for 8-mesh to ½-in. coal, as shown in Figs. 4 and 4A.

Although it is well known from practical service tests that coal-spray oil greatly reduces dusting and heating, it has been found desirable to obtain laboratory data on the effectiveness of various oils. An extended series of investigations, fully reported in the literature, has shown that heating, the forerunner of spontaneous combustion, is definitely due to air oxidation. This investigation corroborates the fact that fines increase the heating tendency and that it is desirable to exclude them from storage piles. Excellent evidence in support of this view is given by Winmill,[7] who shows that the relative rates of oxygen absorption are extremely high for smaller-mesh coals, as shown in Fig. 5. The ignition temperatures also are high for the coarser coals, decreasing rapidly with fineness until a size of about 100-mesh is reached, as shown in Fig. 6.

The effect of coal-spray oil in reducing spontaneous heating is quite evident on coals as fine as 8- to 10-mesh but is of little advantage on dust because of the excessive quantity of oil required. If a gallon per ton were employed to spray 1-in. cubes of coal, approximately 333 gal.

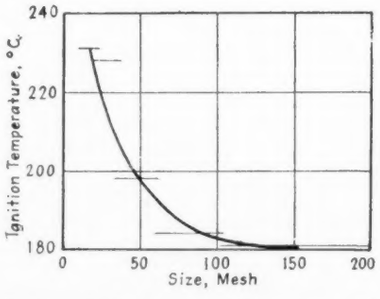


Fig. 6—Ignition temperatures vs. mesh size of coal

per ton would be required to cover the same surface area on 200-mesh coal, and 32 gal. per ton would be needed to cover the same surface area on 20-mesh coal. It is evident that spraying to reduce spontaneous combustion is not economical for the finer meshes, although it has the advantage of laying dust. This may be considered its main advantage for coal fines.

[6] K. Bunte and H. Brückner: *Angewandte Chemie*, 47, 84 (1934).

[7] T. F. Winmill: *Trans. Inst. Min. Eng.*, 51, 493 (1916).

SAFETY PRINCIPLES

+ Embodied in Operating Program

At Republic's Northern Mines—II

By J. L. HAMILTON

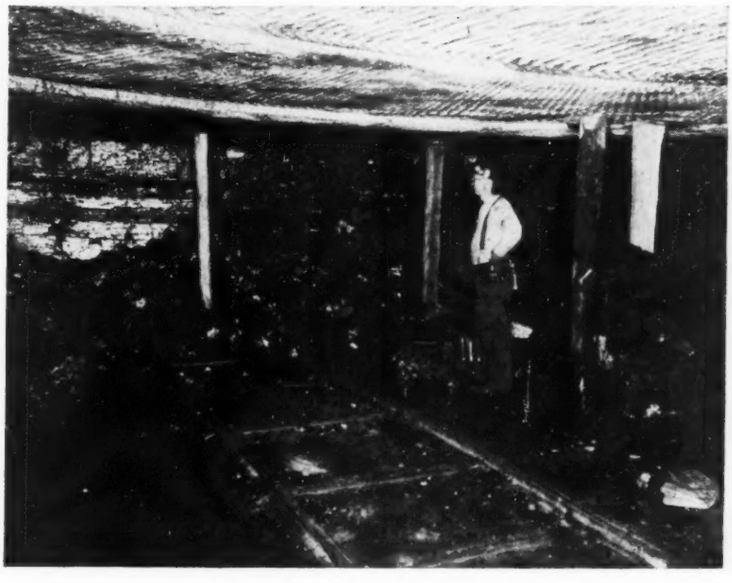
Safety Engineer, Northern Coal Mines
Republic Steel Corporation
Uniontown, Pa.

ACCEPTANCE of the principle that management backing is absolutely essential is the keystone of the safety work at the "Northern coal mines" of the Republic Steel Corporation. Consequently, as detailed in the first instalment of this description of the safety program at these mines (*Coal Age*, May, pp. 195-198), management has taken upon itself the responsibility for initiating and carrying on the safety work, creating and keeping alive interest in safe working methods among mine employees, developing safe operating practices, and keeping mines and equipment in safe operating condition.

In addition to the other educational methods described in the May issue, first-aid training has been found an important method of maintaining interest in safety. Such training is given by key men who have been certified as instructors by the U. S. Bureau of Mines and an endeavor is made to have as large a percentage of the workers trained as possible. Approximately 80 per cent of the miners at each plant are trained yearly. The classes afford a good opportunity for a discussion of past injuries and the necessity for prompt first aid. Employee interest in this training always has been good and it is felt that it not only prepares them to take care of their fellow workmen in time of need but at the same time has the effect of making them more careful workers. At the close of the training period the men are examined by Bureau of Mines representatives and if properly trained are certified. From this group first-aid teams are selected and trained for competition, and when possible are entered in contest work.

Employees are instructed to report any injury, no matter how slight, to their foreman immediately, so that first-aid or medical attention can be provided at once. In addition to first-aid stations at convenient points on the surface and in the mines, the practice of carrying first-aid supplies in each locomotive recently has been adopted, as the motorman usually is one of the first men approached in case of injury. The supplies are sealed in a paper sack, which is placed with a list in a metal box. These boxes are brought out at the end of the shift and the supplies are checked and any items used are replaced. Use of supplies also indicates the occurrence of an injury which might otherwise be missed, and also reduces the possibility of pilferage of material. At the end of each shift, the men are questioned as they pass through the lamp house as to whether they were injured during the day, and if any injuries

View of a one-man place in Indianola mine, showing safety posts and car stop on the rail. The loader wears an electric lamp, safety hat, goggles and safety shoes. Refuse is ricked behind the timbers to the right.



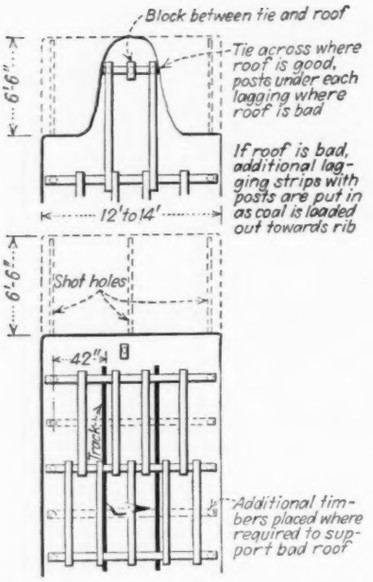

Block between tie and roof
Tie across where roof is good, posts under each lagging where roof is bad
If roof is bad, additional lagging strips with posts are put in as coal is loaded out towards rib
6'-6"
12' to 14'
6'-6"
Shot holes
42"
Additional timbers placed where required to support bad roof

Fig. 2—Method of timbering under drawslate in Connellsville region mines, Republic Steel Corporation

are reported the proper steps for investigation and treatment are undertaken immediately.

Mine-rescue stations are maintained and teams from each of the mines are trained monthly under the supervision of the safety engineer. This training is supplemented at regular intervals by examinations by Bureau of Mines instructors. The men learn not only how to wear apparatus but also are instructed regarding mine gases, their properties and methods of detection, together with the causes of mine fires, explosions, and work pertaining to rescue and recovery operations. The stations are well maintained and an adequate supply of repair parts and materials is kept on hand at all times.

To keep employees informed regarding the number of injuries which have occurred under each foreman during the current month and the year to date, together with a description of the last lost-time injury, a record board about 8 ft. high and 12 ft. wide has been erected near the entrance of each mine. On these boards is painted each foreman's name together with the number of injuries charged to each. If no injuries have occurred on the foreman's section during the month, a green light is kept burning above his name; however, should a lost-time injury occur, the green light is replaced with a red light which is kept burning for the remainder of the month. The red light attracts attention and in large letters on a portion of the board is printed the injured employee's name, his check number and a description of how the injury occurred.

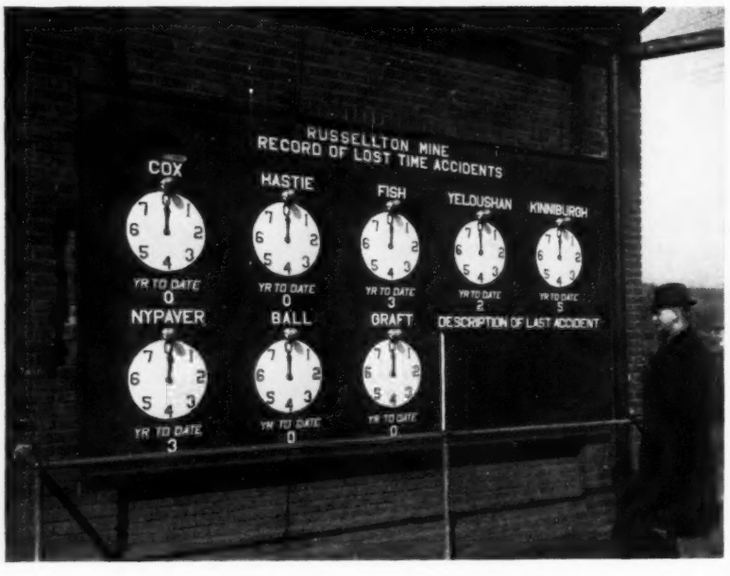
At the close of the month the number of injuries which occurred during the month are added to the foreman's yearly total. The red lights are then removed and replaced by green globes. The men are frequently asked while at work regarding the number of lost-time injuries which have been charged against their foreman or section and it is interesting to know how closely the board is watched. Through the description of the injury, the men are promptly informed regarding how injuries are occurring and can take immediate steps to prevent being involved in a similar situation themselves.

Another method of stimulating employee interest is to have the foremen report all unsafe practices on forms provided for that purpose. These unsafe practices include place improperly posted, mine car not properly blocked, mining coal without eye protection, coal not spragged, etc. Reports are made out in triplicate by the foreman, one copy going to the superintendent and one to the safety department, while the third is handed to the workman. These reports are tabulated and filed in an envelope provided for that purpose. When an employee becomes a frequent violator of the safety rules, he is interviewed by the local management, which can procure the envelope containing his record and bring it to his attention. If this does not have the effect of changing the man's attitude toward safety, disciplinary methods may be used. A bulletin board is erected near the entrance to the mine and on this board is posted in large print daily the unsafe practices submitted by the foremen together with the violator's name and check number. Very few, if any, of the men desire to see their name and number posted.

Other bulletin boards are placed at points of vantage about the mine. Posters for these boards, which are kept clean and attractive, are changed frequently. Several amateur cartoonists are employed in and about the mines. These men draw safety posters which are later made up in blueprint form and usually create considerable interest. A safety banner is given each month to the mine having the best safety record during the previous month. While the cost of such a banner is very small, the foremen and workmen consider it an honor to have it displayed at their mine and it has been a great help in creating a competitive spirit.

Monthly safety inspections are made of each mine and surface plant. The inspector not only contacts the superintendent or mine foreman on these visits but also accompanies the assistant foremen, firebosses, electricians, and outside foremen at frequent intervals. These men are in constant contact with the workers and during these inspections unsafe practices that are being overlooked can be called to their attention. Inspections are made not

Bulletin boards present a visual record of safety progress at Republic Steel Corporation mines. The author is shown scanning the record at Russellton.



only during the day shifts but also at night at frequent intervals, for the reasons outlined above. These night visits also afford the inspector an opportunity to talk personally with the employees while at work. The inspector should make the most of this inspection and take advantage of every opportunity to spread the safety news. The night foremen, when properly approached and assisted, are just as anxious to have a good safety record as the day foremen and consequently are helped in every manner possible.

A report of examination is made by the safety inspector at least monthly. Every effort is made to ferret out unsafe practices, dangerous and hazardous conditions, and have the causes remedied. When men are found doing their work in an unsafe manner, they are told why it is unsafe and, where possible, a concrete example of how an injury

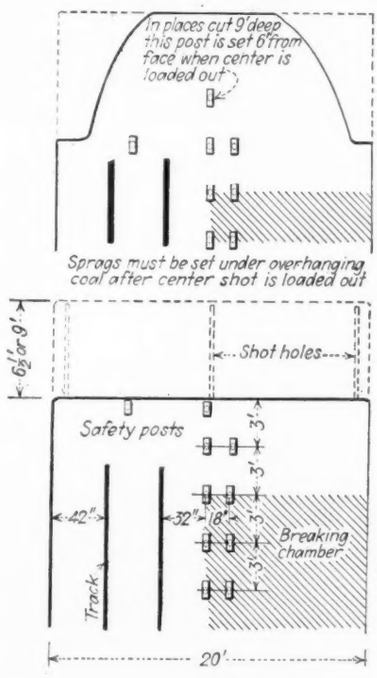


Fig. 3 — Timbering plan in rooms, Indianola mine, showing "breaking chamber"

occurred from such a practice is cited. Informing the man of how seriously the worker in the example was injured, what hospitalization was necessary, and how much time was lost usually has a better effect than a severe rebuke.

Monthly safety letters are written by the safety department and sent to the mine management. These letters keep them informed promptly regarding accidents which may have occurred and offer suggestions or recommendations for the prevention of recurrence. The practice also keeps them informed regarding the statistics on injuries at all the company operations.

Outstanding records made by workmen, foremen and miners are presented to the Joseph A. Holmes Safety Association so that credit can be given when due. When certificates are awarded, a suitable and impressive presentment is made. In 1936, two individual awards were received by members of the Republic Steel force. One was to Joseph Nypaver, assistant mine foreman, Russellton mine, for operating his section of the mine without a lost-time injury from Dec. 21, 1934, to Jan. 24, 1936, and continuing, with 233,696 man-hours of exposure, with an average of 112 men employed. The other was to James Winning, Republic mine, for having worked a total of 54 years in and around the mines (37 years underground and 17 years on the surface) without a lost-time injury. Mr. Winning started work at the Beechcliff mine, Chauncey Andrew Coal Co., Youngstown, Ohio, in 1881.

Examinations Are Required

All persons which it is proposed to employ must pass a physical examination, in the course of which up to 20 per cent are rejected. An applicant sees the mine foreman, who, if he decides he would like to have the man, sends him to the superintendent, by whom he is questioned about his past connections, his attitude toward safety and on other points which might throw light on his possibilities as a safe and efficient employee. If the superintendent is satisfied, the man goes to the plant physician, and, if he passes the examination, returns to the superintendent for a further discussion of conditions of employment, particularly from the safety standpoint. At that time the man receives, and is required to receipt for, a copy of the safety regulations. New employees are taken into their places by the assistant foreman, who carefully explains their duties and the steps which they must take to protect themselves. Thereafter, for some time, new men are questioned frequently on rules, company policy on protective clothing, etc.

Republic Steel Corporation regulations for the Northern group of coal mines stress (a) safe working by all employees and (b) reporting immediately to the foreman any defective or dangerous conditions or any unsafe practices observed. In

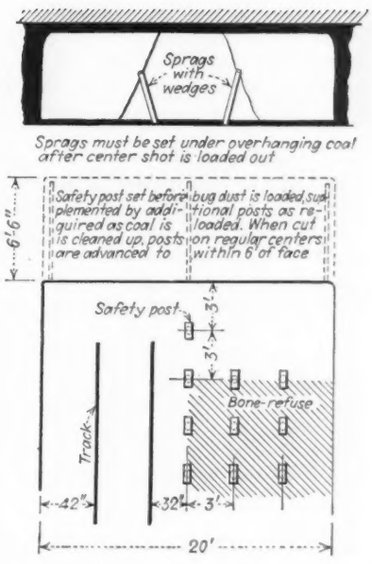

Sprags with wedges
Sprags must be set under overhanging coal after center shot is loaded out
6'6"
Safety post set before bug dust is loaded, supplemented by additional posts as required as coal is loaded. When cut is cleaned up, posts on regular centers are advanced to within 6' of face
Safety post
3'
3'
Bone-refuse
Track
42"
32"
3'
20'

Fig. 4—Timbering plan, Russellton mine

addition to general rules governing the work of all employees, specific regulations applicable to the peculiar problems of the various mine occupations have been prepared. Loaders, for example, are responsible for the condition and safety of their places, and the character of the top is reflected in specific injunctions governing frequent inspection and sounding, as well as insistence on strict compliance with posting standards. These standards (Figs. 2 to 4) represent the minimum number of timbers which can be set and also establish minimum track clearances and regulate the method of disposing of refuse.

At Russellton and Indianola mines, where considerable refuse is derived from the middle of the seam, it is ricked up back of the timbers. At Indianola (Fig. 2), posts are set in two rows close together to leave a "breaking chamber" along one rib. The character of the top makes it difficult to hold it all the way across the place under the normal system of support, and consequently the breaking chamber was adopted to permit the immediate top to cave in this space and thus relieve the strain over the roadway. Safety posts must be set at all mines as shown in Figs. 2 to 4 before the first shot is fired in the face.

Each loader at Indianola and Russellton is provided with an M-S-A car stop, with which he is charged at the time it is taken out. If the stop is returned when employment terminates or is lost for good reason, the charge is cancelled. Two men, with some exceptions, work in

a place, and one stop must be placed on the rail in front of the car, with the other at the rear. To prevent cars from pulling short extension rails, or "jumpers," loose from the main track and riding on into the face, such extension rails must be fishplated and bolted at all times. Also a steel tie must be installed about 10 in. back from the ends of the rails to keep them from spreading and letting the car run past the block. At Connellsville region mines, the loaders are provided with wooden horses for blocking cars. Loaders or any other persons are forbidden to chop or knock out timbers, which must be removed when necessary by post pullers or other mechanical means, and then only by experienced men upon receipt of instructions from the mine foreman or assistant. Loaders, as noted above, are required to keep the rock dust up in their places.

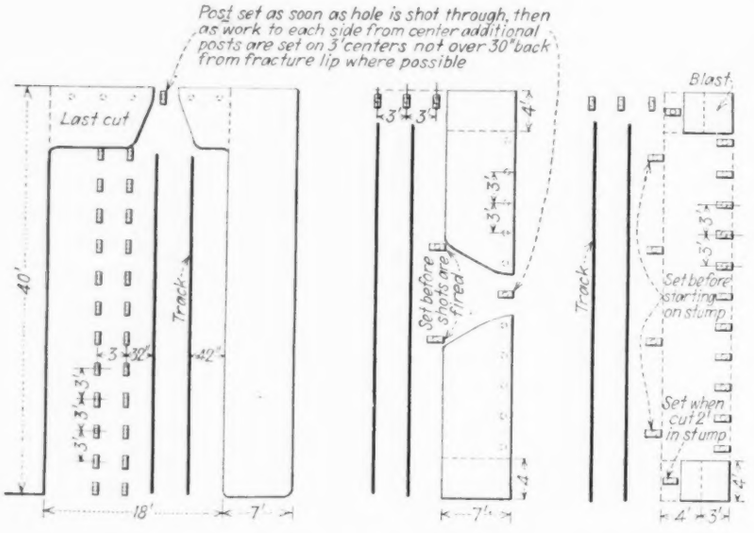


Fig. 5—Method of timbering in the Thick Freeport seam mines, Republic Steel Corporation, in pillar recovery

In addition to other regulations governing their work, transportation men must not wear loose clothing, and must place cap-lamp cables under their jackets or shirts. When rerailing cars, care must be taken to cut off the power on all near-by wires. Rerailers are carried on all locomotives to facilitate replacing cars, and when lifting is restorted to, either by transportation employees or men engaged in other work around the mine, they are enjoined to keep the legs well together and to use care in avoiding getting in position where strained backs, ruptures or other injuries might result. Coupling of moving cars or locomotives is strictly prohibited, and this practice not only has promoted safety but also has saved time by eliminating missed couplings, knocking cars off the track, etc. All motormen are provided with steel hand hooks to raise the link when coupling into trips, and experiments are now being conducted in the use of special sticks for coupling cars by the tripriders. Also, tripriders and other men handling cars are forbidden to step between cars or place their feet inside the line of the car side when coupling or uncoupling. Riding between cars is another practice prohibited by the rules. When trips are hauled mechanically up a grade of more than 3 per cent, an effective drag must be used. Cars standing on any grade must be blocked by an approved stop. Naturally, lights are required on all moving trips and also on standing cars containing rails, pipe and similar materials projecting over the end. Parked locomotives must be placed either tight together or at least 10 ft. apart. Trolley poles or cable hooks on locomotives and cutters left standing must be taken off the wire and the reverse handle left in the "off" position.

All shooting at Republic's Northern mines is done by shotfirers. These men are responsible for the transportation of caps, using special containers which when not in use are kept in special locked storerooms on the surface. Shortfirers also load and shoot all holes, and at Republic, Trotter and Davidson mines also handle all explosives and blasting materials. At the other operations, explosives sufficient for one day's work are carried into the workings by the miners in special canvas containers. These must be hung on a post or placed in a cubbyhole in the rib at all times at a point at least 50 ft. from the face. Explosives must not be taken out of the container until the shotfirer or other person authorized to shoot has entered the working place and taken charge. On the surface, explosives are stored in appropriate magazines protected by earth-and-timber barricades. Caps are stored in separate magazines.

Maintenance and repair men, in addition to other rules, are forbidden to work on any machine or equipment without first cutting off the power. Drills, hammers and other tools with mushroomed heads or heads in any other dangerous condition are prohibited. Motor and machine pits must be equipped with covers, which must be kept in place when the pits are not in use. To prevent contact with wires or loose pieces of roof, tools, steel rails, etc., must not be carried on the shoulders by any employee.

All underground employees are required to wear safety hats, and all employees, underground and on the surface, must wear safety shoes with steel toe box. Men whose duties make it necessary for them to use an axe, hammer, sledge or pick must be equipped with spectacle-type goggles. This ruling applies primarily to men other than those engaged in maintenance and repair work, including welding, who are furnished goggles suited to their particular occupations by the company. Other men are required to purchase their goggles. M-S-A Comf-O-Caps, Coal-Caps, Iron Age and Hy-Test safety shoes, and American Optical and Chicago Eye Shield goggles are stocked and are sold to employees at a profit of not over 10 per cent to cover handling cost, etc. Men who normally wear spectacles are required to purchase prescription-ground goggle lenses, which are furnished at cost.

CINCINNATI CONVENTION

+ Attacks Coal Problems on All Fronts; Industry Increasingly Receptive to Change

"BIGGEST in history" was the advance promise made by the sponsors of the 14th Annual Coal Convention and Exposition of the American Mining Congress, held at Cincinnati, Ohio, May 17-21. And biggest in history and interest it was. More equipment on display, larger exhibits, an increasing number of manufacturers showing their wares—and a record-smashing attendance. When the last registrant had been tallied on the closing day, the total registration at convention headquarters in the Cincinnati Music Hall stood at 4,777, as compared with 3,889 in 1936. The attendance tally for coal executives and operating men was 2,802—an increase of 616, or approximately 28 per cent, over the previous year's registration.

Not the Whole Story

Figures alone, however, do not tell the whole story. An even more significant index is found in the wide range of topics covered by the program, the expansion to give more attention to a discussion of training men for tomorrow's supervisory positions, and the definite recognition of the important place both scientific and commercial research must occupy in strengthening coal's armament in the battle of the fuels. Mechanization, of course, was very much to the fore. Operators who have yet to take their first steps in mechanical loading listened closely to the recitals of the experiences of fellow producers who already have abandoned hand loading. And members of both groups roamed the Music Hall aisles to study what the exhibitors had to offer which would reduce production costs or increase the salability of coal.

Operators attending the convention last year found the spotlight playing on the importance of coordination in developing efficient production methods. The army that descended upon the Queen City last month heard that theme reiterated in technical-session papers recounting how mining and preparation practices as specific operations had been revised to enable producers to capitalize more fully on their investments in mechanical-loading equipment. Research men told how their studies in coal composition and burning characteristics presaged new conceptions which would be reflected in changed mining and cleaning methods and influence future sales strategy.

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Cincinnati Ringmasters

• C. E. Cowan, vice-president, J. H. Weaver & Co., and national chairman of the program committee, headed the group responsible for the technical sessions of the 14th Annual Convention and Exposition at Cincinnati. W. W. Dartnell, consulting engineer and chairman of the committee on arrangements, was another member of the directing group. Bruce G. Shotton, Hendrick Manufacturing. Co. and chairman of the Manufacturers' Section of the American Mining Congress, headed up the exposition end; L. W. Shugg, General Electric Co., was again director of exhibits.

The eight technical sessions of the convention were presided over by the following chairmen:

E. J. Newbaker, vice-president, Berwind-White Coal Mining Co., Monday morning.

C. A. Gibbons, general manager, Susquehanna Collieries Co., Monday afternoon.

Wesley Harris, president, Bicknell Coal Co., Tuesday morning.

C. F. Hamilton, vice-president, Binkley Coal Co., Tuesday afternoon.

Carl T. Hayden, vice-president and general manager, Sahara Coal Co., Wednesday morning.

L. C. Campbell, assistant to the vice-president, Koppers Coal Co., Wednesday afternoon.

George H. Rupp, manager, coal mining department, Colorado Fuel & Iron Co., and Glen A. Knox, general superintendent, Gunn-Quealy Coal Co., Thursday morning.

R. E. Salvati, general manager, Island Creek Coal Co., Thursday afternoon.

Changes Press Fast

Rubber-tired vehicles underground, machines which make parts of the standard operating cycle unnecessary, streamlined ventilation, streamlined topworks, faster machines, "wireless" communication for underground dispatching, more effective use of present-day equipment, different sizes of the same coal which are really different coals because of varying percentages of coal components were only a few of the developments touched upon in formal presentations or hinted at in informal discussions. With the parade moving so swiftly, exchanges of information between operators, declared Julian D. Conover, secretary of the American Mining Congress, in opening the convention, are imperative if producers are to avoid blind flying with its costly mistakes and be in a position to provide for economies that protect them against competition from other sources of heat.

Elimination of unfair competition within the bituminous coal-mining industry is one of the main objectives of the new coal-control law. But, as Paul Weir, consulting engineer, Chicago, pointed out in the closing technical session of the

convention, that act does not eliminate competition from without. Neither does it discourage more efficient utilization of coal by the consumer nor provide for a reduction in freight rates. "Certainly it does not contemplate lower wages for miners." Survival in the inter-industry competitive struggle still depends upon decreasing production costs. Under existing conditions, such decreases can be found only in "the use of a maximum amount of labor-reducing machinery."

While lower production costs must be won, better marketing based upon a better understanding both of the product itself and how it is used also can play an important part in improving the competitive position of coal. The constant shifting of coal consumers from one source of supply to another, asserted J. E. Tobey, manager, fuel engineering division, Appalachian Coals, Inc., should be considered evidence that more knowledge is needed in the field of distribution. Too often, he suggested, the buyer expects too much of the coal and demands too little of the equipment in which it is burned.

"What the Public Wants"

In marketing anthracite, said Bruce Payne, president, Payne Coal Co., producers have made the mistake of endeavoring to force the consumer to accept sizes he no longer wants. Now, with 40 per cent of its former market lost, the hard-coal industry must make a determined struggle to recover lost ground. Half of the loss has been to oil and gas, which, in operating hand-fired furnances, have the edge on coal from the standpoint of greater convenience; the other half has been lost to coke and bituminous coal, which have been able to invade anthracite-consuming areas with lower prices.

Producers, continued Mr. Payne, fatuously have preferred that their customers continue to be sold on the virtues of large-sized anthracite, for which the operator demands and gets—when he can sell it—a higher price. But the way to recovery, in the opinion of Mr. Payne, is to induce the consumer to seek both economy and carefree heat by installing a domestic stoker. Once the consumer recognizes the convenience of the small coal thus burned he can be persuaded to pay a profitable figure for that salvage product which now is sold by the mines at less than the actual cost of production.

Turning to the labor side of the problem, Carel Robinson, manager of mines, Kelleys Creek Colliery Co., emphasized that workers are willing to do their part and appreciate a share in the community of interest between employer and employee, but resent any attitude on the part of management which smacks of paternalism. Teamwork between management and labor always should be a goal. Now that mechanization is rapidly displacing old methods and many workers are being shifted from a tonnage to an hourly basis, the necessity for such cooperation cannot be ignored. With mechanization, the isolation of the miner and his buddy is giving away to crew work, this enlarges the opportunities for the development of a healthy team spirit.

That mining extension courses can be made a real factor in improving efficiency in mining was evidenced by reports from C. E. Lawall, director, School of Mines, West Virginia University; H. E. Nold, professor of mining engineering, Ohio State University, and H. B. Northrup, director, Minerals Industries Extension, Pennsylvania State College. Men trained in the extension courses, it was pointed out, form a reservoir from which many coal-mining executives choose their mine officials. In West Virginia, 1,650 men entered the night classes last year and 172 attended the short course given in the summer. Night classes, each with a full-time instructor, are held in eleven districts and summer courses are offered in three mining centers. Entrants to these classes have an average of eight years of public school education, and the educational background is increasing.

Classes designed to train mine workers to qualify in examinations for firebosses, foremen and other supervisory positions were first organized in Ohio more than ten years ago. A normal class program extends over three years, but in some cases a fourth year is added. Training and textbooks are free, although this system, in the opinion of Prof. Nold, sometimes leads to a lack of appreciation of the value of the course on the part of some students. Two new classes were started last September with an enrollment of 353, but attendance had declined to 261 two months later. Only one of three schools established during the past two years in centers of small mines (350 tons per day or less) has been fully successful.

In Pennsylvania, explained Mr. Northrup in a paper read by Dr. A. W. Gauger, director, Mineral Industries Research, Pennsylvania State College, the program on extension training was sporadic until 1931. Since that time, however, 851 men in the anthracite and bituminous regions of the State have been awarded certificates for completing the three-year course. Summer courses, taught some years ago, were discontinued in favor of the extension courses. The extension division has prepared three textbooks and plans to revise these every two years to keep them abreast of progress.

Movies as a medium for telling a story found increasing favor at the convention this year. The "Little Theater" of the Jeffrey Manufacturing Co. at the exposition hall was a magnet for coal men who wanted to see equipment working at the mines. George E. Stringfellow, Thomas A. Edison, Inc., was host to 108 delegates and their wives at a dinner party May 18 followed by movies showing the construction and operation of Edison storage batteries and Edison cap lamps. The interest displayed in rubber-tired haulage was further capitalized by private showings by W. Van Brandt, Electric Storage Battery Co., of a film of underground operations at the Blue Bird mine in southern Illinois. And R. A. Suppes, Brule Smokeless Coal Co., used a motion picture to put over the story of conveyor and aerial tramway transportation at the Wednesday afternoon meeting of the convention.

Mechanization Pace Quickens

"THE INDUSTRY is definitely heading toward the use of a maximum amount of labor-reducing machinery and a minimum amount of labor. This transition naturally will take place over a long period of time. The battle to maintain a proper competitive position will continue for many years"—and mechanization will play the major part in that battle. Concrete proof of this trend is to be found in the history of Illinois, which has increased its percentage of coal loaded mechanically underground from 0.4 in 1924 to 55.6 in 1936, while the percentage of total production contributed by stripping operations has grown from 3.4 to 18.8 per cent during the same period. West Virginia loaded 3.7 per cent of its output mechanically in January, 1936; in December the figure was 11.2 per cent.

These conclusions and supporting evidence were given by Paul Weir, consulting engineer, Chicago, in a forecast on "The Future of Mechanical Mining," presented at the closing session of the convention. No other conclusion, he insisted, is tenable. The competitive position of the industry compels lower production costs, and mechanization is the only way in which such reductions may be achieved under existing conditions. Operators who think that the new Guffey-Vinson act will be an umbrella to protect the inefficient are due for a rude awakening. "The dilution of weighted average costs by the efficiently operated mines most certainly will remove protection from the inefficient."

Man-made limitations may prevent the fullest employment of mechanization at mines already opened, but no such handicaps are present in developing a new operation, said Mr. Weir. Such a mine may be trackless or may utilize the conventional transportation system; the choice will be determined by a balancing of original investment charges and operating costs. The small loading machine has enlarged the opportunity for productivity in thinner seams; conveyors, too, both alone and in combination with mobile loaders, are finding a wider application. Large-

capacity mine cars win increasing favor. Rubber-tired machine trucks, locomotives and cars are being developed.

Looking to the future, Mr. Weir stated that several manufacturers are designing combination machines to dig coal from the solid face and load it into cars or on conveyors, thus eliminating cutting, drilling and shooting. Diesel locomotives, now in use in some European mines, also must be considered. Machines that will both cut out and gob drawslate and bands in seams in one operation now are on the market. Mechanical cleaning has increased the operator's knowledge of the physical and chemical properties of coal and given him a greater understanding of consumer requirements. This probably will lead to the making of several different classes of coal from the same mine by cleaning at different specific gravities.

Continuity of coal flow is basic in economical mechanized loading, declared G. Stuart Jenkins, general superintendent, Consolidated Coal Co., Illinois. Until recently, 50 per cent continuity was an excellent showing because time was wasted in moving machines from place to place. Now trackless mines with rubber-tired haulage units and conveyors have been developed, and continuity has improved 30 per cent. Tracklaying costs about 5c. per ton when planned to give reasonably prompt delivery of cars to mining machines, so there is a real gain in wiping out this item.

Cut More Places

Cutting machines with caterpillar tracks which carry the machine from face to face on their own power enable them to cut 25 per cent more places. Cutting has been speeded and that makes conveyor loading more practicable. Developments which make shooting on the shift both feasible and safe also contribute to the economies of mechanical loading. Mobile cutting machines, added Mr. Jenkins, are necessary with rubber-tired transportation.

Increase in the quantity of small-size coal has cut materially into operating profits. This increase has been largely due to mechanization, asserted J. G. Crawford, general manager, Valier Coal Co., Illinois. In 1915, according to John A. Garcia, consulting engineer, Chicago, said Mr. Crawford, the average price of Franklin County (Illinois) coal was $1.07 per ton; 88c. was absorbed by operating costs, 17c. was overhead, leaving 2c. profit. At that time, sizes below 2 in. sold for 60c. and the larger sizes averaged $1.50 per ton.

The minus 2-in. fraction in 1915 constituted 48 per cent of the entire product; this gradually increased to 50 per cent and now is about 55 per cent, with the increase largely chargeable to mechanization. There are now six or more sizes under 2 in., whereas in 1915 there were but four. This again cuts profits. Coal over 2 in. in diameter sells for 70 to 90c. per ton more than coal under 2 in. The definition of "degradation," declared Mr. Crawford, should cover not only breakage of and from the large sizes but also the increase in the quantity of ash in the fine sizes due to that degradation,

How one large producer has been able to hold the percentage of screenings comparable to that with hand loading and yet increase production per loading machine, however, was related by E. Earle Snarr, research engineer, Chicago, Wilmington & Franklin Coal Co. Experiments to improve the single undercut method of face preparation for mechanical loading were started several years ago at the New Orient No. 1 mine, in southern Illinois, with two shearing machines of an early type. Next the arc-shear machine was tried and in the past year two newer machines with 9-ft. bars capable of cutting 1 ft. below the track to 8 ft. above the track and shearing to a 21-ft. rib dimension were installed.

Present practice calls for two shear cuts, one 11 ft. to one side of the center of a 24-ft. room and the other 3 ft. to the other side, in addition to a horizontal cut. This has increased the coal yield per pound of powder over 50 per cent, greatly reduced the percentage of screenings, cut cost of loading-machine repairs, and resulted in coal less shocked by explosive and so minimized transportation degradation. The coal is in the No. 6 Illinois seam and averages 9 ft. in thickness, with the lower 8 ft. mined.

Installation of a Sullivan 7AU machine at the Independent Coal & Coke Co., Utah, last year, said Walter F. Clarke, general superintendent, increased the larger sizes by 15 per cent, brought down the coal better for track-mounted loaders, decreased the number of shotholes 40 per cent and the quantity of explosives 30 per cent. Another advantage with shearing is the cutting of square corners at the ends of a wide face. A unit produces 570 tons per shift in coal 16 ft. thick. The coal lies on a pitch averaging 10 per cent, but has occasional rolls with grades up to 14 per cent. Rooms are driven on 112-ft. centers under cover averaging 150 ft. Cars of 136 cu.ft. capacity are mechanically loaded to an average of 3.1 tons.

Track must be kept within 13 ft. of the face in a 24-ft. room to accomplish parrallel shearing of the ribs. The cutter chain, which operates at 750 ft. per minute on a 5-in. bar, is being changed from 7-position to 9-position to lessen the duty on the bits. No appreciable wear of mechanical parts has yet appeared. One difficulty not yet overcome in mechanical loading, remarked Mr. Clarke, is that pieces of wood from ties used in certain instances in steep places under the caterpillar treads find their way into the customers' bins. Cleats to be tried on the treads are expected to solve the problem.

Officials of the Island Creek Coal Co. are fully sold on the use of track-mounted cutting machines in connection with mobile loaders, according to P. D. Everly, preparation superintendent. In only three of the seven mines, however, is an additional investment in shearing machines justified. The coal is much harder in four mines than in the other three. In the latter, mechanization brought a marked decrease in realization; in one of these three, for example, nut-and-slack increased from 30 to 53 per cent.

After tests on undercut coal showed that only 24 per cent of the minus ¼-in. yield was made by the cutter and 76 per cent by shooting and handling, there was no further delay in giving shearing a trial. Two combination cutting and shearing machines (Sullivan 7AU) with 9-ft. bars making a 4-in. kerf were installed; the advantages of shearing immediately were

Mechanization Case History

• "Illinois presents a rather complete case history of mechanization, the reasons for it and results obtained," said Paul Weir in forecasting the future of mechanical mining at the Cincinnati convention. "For the ten years prior to 1934, the coal industry in this State had to combat oil, gas, more efficient utilization, increased freight rates and low non-union wage scales in competing fields. The battle consisted in reducing costs of production by means of mechanization while still paying the prevailing union wage scale."

At the start of this period, the basic hourly rate was 93.75c; hand loading dominated the industry with 96.2 per cent of the production coming from hand-loading operations, 3.4 per cent from strip pits, and only 0.4 per cent of the output was mechanically loaded. By 1936 the basic hourly rate, which had dropped to 76.25c late in 1928 and to 62.50c in the summer of 1932, was 78.57c. But the percentage of tonnage hand-loaded had fallen to 25.6, while that mechanically loaded was up to 55.6 per cent and the strip-pit proportion was 18.8 per cent of the total.

"The gross sales realization, which can be considered as a measure of the cost of production, has declined from a high of $2.27 per ton on the Jacksonville scale in 1924 to $1.56 for 1935. This reduction of 71c per ton in gross realization during the 12-year period, while the net decrease in the wage scale was approximately 16 per cent, indicates the dilution of the State-wide realization by those mines favored with lower costs accruing out of mechanization. By means of intensive mechanization Illinois has attempted to maintain its competitive position."

revealed. Soon the bars were changed to cut a 5-in. kerf, which is more easily dusted. Increased yield of 5-in. block, greater production due to less tight and overhanging coal at the rib, a square instead of an arc face, and approximately a 35 per cent reduction in powder cost were among the advantages gained.

When the loaders were installed at Island Creek in 1935, the coal was undercut for them with track-mounted machines that had been put in service in 1928. This equipment had 7½-ft. cutter bars making a 5½- to 5-in. kerf. A change from shortwall cutters to mounted machines greatly reduced the difficulty of keeping machines from cutting into the bottom and also eliminated scrapping.

From a so-called "Pencil-Mark" coal in Arkansas only 20 in. thick, said Guy E. Lipe, manager, Dixie Fuel Co., his company gets its entire product—and the coal is 90 per cent lump. The Jewell Coal Co. and the Dixie are the only two companies working this coal by the scow method. This system suits the conditions admirably, for it is a strong coal without slips. At first coal was transported from face to roadway by conveyors, but this gave way to the use of a 4½x20-ft. plate, or scow, set under the coal and dragged when the coal had fallen in an unbroken mass upon it.

Work Four Longwall Faces

Four longwall faces, each producing 100 tons daily, are worked every winter. These faces are 420 ft. long with a 12-ft. road up the middle cut in the bottom rock to a depth of 4 ft. This bottom is lifted during the night shift so that the face will be ready for loading operations the following day. A rope of ⅝-in. diameter and twice the length of the face, actuated by a hoist and directed by pulleys, drags the scow into the cut under the coal and drags it out again when the face coal has been dropped on it. Coal is undercut in the bottom and overcut in the shaly material of the top by longwall machines. A Sullivan cutter turned upside down makes the upper cut. A crew of two men cut two such faces daily; the top cut is made twice as fast as the bottom cut.

At the roadhead a hoist is used to lift the coal in sections off the scow onto 4½x10-ft. flat cars, which are held in place by a latch until they are individually loaded. As the face has proceeded straight up the 5-deg. pitch, the cars run away by gravity as soon as released. While a scow from one side is being unloaded, a scow on the other side is being drawn with its load to the roadhead for readiness for unloading in its turn. Starting at 50 ft. per minute, the scow is accelerated to twice that speed by the variable-speed motor on the hoist.

Coal slabs or blocks on reaching the surface pass over a screen removing smalls and reach a conveyor where a breaker constructed somewhat like a guillotine (but with a single row of teeth in place of the inexorable blade) falls on it, penetrating the few inches necessary to break part of it down to lump size. The rest of the block, continued Mr. Lipe, proceeds to another "guillotine," where it also is broken down to the required dimensions.

When all the factors, such as entry driving and depreciation of equipment, have been considered, the cost of producing coal by mechanical-loading methods at the Stirrat No. 19 mine of the West Virginia Coal & Coke Corporation (see *Coal Age,* December, 1936, p. 551) is 10c. per ton less than with hand loading, stated John C. Lowry, Jr., assistant manager of mines. A new section is being prepared to replace the area now in active mechanical loading operation where 65,000 tons has been and 55,000 tons remains to be mined. Estimates indicate that the cost of this preparatory work will approximate 8c. per ton of coal to be recovered.

Cover runs up as high as 1,000 ft. and the immediate roof is 1 to 14 in. of drawslate with an occasional kettle bottom. Four blowers equipped with Ventube are provided for ventilation of working faces. The entry chosen for the installation of mobile loaders is 825 ft. long and was driven by hand. The 1,100 ft. of entry with 45 in. of coal and 4½ ft. of rock to be removed to attain height was driven in 4½ months, said Mr. Lowry.

Among the matters learned in the operation, continued the speaker, was that belt conveyors cannot be too carefully aligned and set to levels. This was done with surveying instruments. It was found that the main belt could not be safely reversed for the carriage of supplies; it was necessary to put a track in at the side for this purpose, laid on steel ties. Fast drills were introduced at first; one struck a piece of pyrite and kicked back at the driller. It is now realized that slow drilling is preferable, even necessary. Rooms, which were formerly on 68-ft. centers and 38 ft. wide, are now set on 41-ft. centers and are 25 ft. wide, leaving only a 16-ft. pillar, practically all of which is recovered. Because of the great weight, a single cut usually will make it possible to gather up the entire width of pillar without further cutting.

Mechanization Saves the Day

"Without mechanical loading of some sort," said T. E. Jenkins, president, National Fuel Co., Colorado, in a paper read by C. E. McWhorter, Goodman Manufacturing Co., "our mine could not have been opened up, for, without it, rapid development of entries would have been impossible. With hand work, panel entries had to be driven in the winter, but now with three times the progress being made, thanks to the use of machinery for loading, summer entry driving suffices to put us in shape for the winter demand. What makes this particularly vital is the fact that all our coal must be mined on retreat; hence it is imperative that entry driving outspeed coal recovery."

Coal thickness is under 4 ft., roof is tender and bottom hard, and all haulageways must be brushed. Shaker conveying fits in well with requirements at this operation. Since April 30, 1936, some 23,700 ft. of heading, crosscuts and room necks have been driven, first with two, and later with five, units, advancing 10 to 11 ft. per day on a triple-shift basis. In the coal alone, stated Mr. Jenkins, the maximum advance per day with four men on each shift has been from 60 to 65 ft. Some difficulty has been experienced with buckling of the pans—especially at changes of gradient—with right-angle swivels and with connections. Permissible explosive has replaced black powder and is giving equal satisfaction with increased safety.

Complete mechanization with chain room and face conveyors, main- and butt-entry belt conveyors and an aerial tram to the tipple was illustrated by R. A. Suppes, superintendent, Brule Smokeless Coal Co., West Virginia. This property is in both the No. 3 and No. 6 Pocahontas coal, but only the No. 6 seam, which is 32 to 36 in. thick, is being worked. Although the floor is an impure fireclay, the seam itself is clean. The aerial tram runs on two locked-coil cables and carrying the coal downhill generates 18 kw. when working; this is fed into the power line.

Why Tram Was Chosen

A long ridge, if compassed by a tramroad, would have necessitated an unduly long and expensive outside haul at Brule, added Carel Robinson, manager of mines, Kelleys Creek Colliery Co. An expensive haulageway underground would have cut off much of this, but the road would have been proportionately steep. So the aerial tram seemed the better solution. The cost of maintaining this tram was compared with the maintenance costs for either of the two suggested roads and consideration also was given to the cost of operation and maintenance of locomotive equipment: the upshot was that the aerial with its regenerating features won with flying colors.

Concentrated working, elimination of yardage except on entries and decreased track and gathering costs are attained by scraper loading on long faces in the Glen White (W. Va.) mine of Koppers Coal Co., according to E. C. George, superintendent. Two scrapers work opposite but independently of each other on an entry with their loading points separated by a 20-ft. pillar. Faces 145 ft. long are retreated on an angle and no cribs are used. Seam thickness is 42 in., the roof is a strong thick sandstone which stands unsupported over large areas, and the bottom is hard. In timbering, one row of props on 7-ft. centers is used for each 7-ft. cut. Routine with the scraper consists of loading the bugdust first, then 8 to 10

ft. of the coal at the far end of the face; then the tail sheave is reset into the cleaned-up space. The face is shot in 25-ft. sections which are loaded in succession toward the entry. All entry development is hand work.

Conveyor-Loading Efficiencies

Efficiencies per man-day in hand loading on conveyors at the Colonial colliery, Madeira, Hill & Co., said Edward Fox, superintendent, in a paper read by Thomas G. Lewis, mining engineer, are 8.32 net tons for multiple units and 11.25 net tons for single units. Other advantages cited include better ton-life of equipment, less loss of production from breakdown of one piece of equipment, and less difficulty in distributing supplies. In breast or room working with conveyors, places are driven 20 to 24 ft. wide (the latter is the maximum without reshoveling to the conveyor) and 400 ft. deep. The pillar is recovered immediately to within 60 ft. of the gangway. Shaker conveyors are extended close to the face and wedged into position so that the shooting will not throw them out of place. Approximately 10 per cent of the shot thus is dropped onto the conveyor without shoveling. When conveyors are used on longface work, rooms 20 ft. wide are driven 400 ft. deep; the conveyor is swung on an arc to reduce the number of loading points required to work out a panel.

An efficiency of 8.95 tons per man-days at a new trackless-conveyor mine operated by hand loading was reported by B. F. Reed, secretary-treasurer, Turner Elkhorn Mining Co. This figure includes all underground and surface employees. Another mine of the company working comparable coal by hand loading into mine cars averages 5.8 tons per man-day. The conveyor mine is in the Elkhorn No. 1 seam in eastern Kentucky; working height is 48 to 50 in., including 6 in. of rash at the top. Equipment includes a 30-in. main belt 1,700 ft. long from the tipple into the mine along the main entry, a 24-in. cross belt and shaker conveyors in working places. Rooms are driven 20 ft. wide, 220 ft. deep and on 50-ft. centers. Although the 10-ft. pillar is abandoned, recovery is estimated to be approximately 80 per cent.

Experience with conveyor at Barnes & Tucker Co., eastern Pennsylvania, said C. P. Brinton, engineer, began in 1931 at the No. 15 mine; at present three belt panel units are working and a fourth is contemplated. Face preparation is complicated by the presence of a 6-in. top bone burned to the coal. Main belts 1,400 ft. long and 26 in. wide are fed by chain flight conveyors. Based on over five years' experience, Mr. Brinton concluded that study of each individual case is necessary before conveyor-application recommendations can be made.

Presence of a 10- to 18-in. middle band does not prevent the mechanical loading of the split Island Creek seam in Logan County, explained T. A. Stroup, chief engineer, West Virginia Coal & Coke Corporation. In fact, 0.5 per cent less ash is found than in the same coal when hand loaded. Because of the hard cutting in the middleman, the track-mounted cutters have 50-hp. motors. The first cut is made in the lower band, or 8-in. laminated coal of the parting; the second in the 6-in. hard bone at the top of the middleman; then a third cut is made in the fireclay separating these two bands, and raking follows. Cutting and raking require about 18 minutes and the setting of bits 8 minutes.

Eleven places are cut per shift. Bits are reset after each 22-ft. place has been cut. Both ordinary and diamond-type bits, said Mr. Stroup, have been used; 61 ordinary bits or 24 diamond-type are needed per face. The kerf is 5½ in. wide and the depth of the cut is 6½ ft. Hard-tip bits have been tried, but they bend back, and their use has been discontinued. About 350 cu.ft. of material has to be stowed or brought out per 6½-ft. advance (see *Coal Age*, December, 1936, p. 553, for further details).

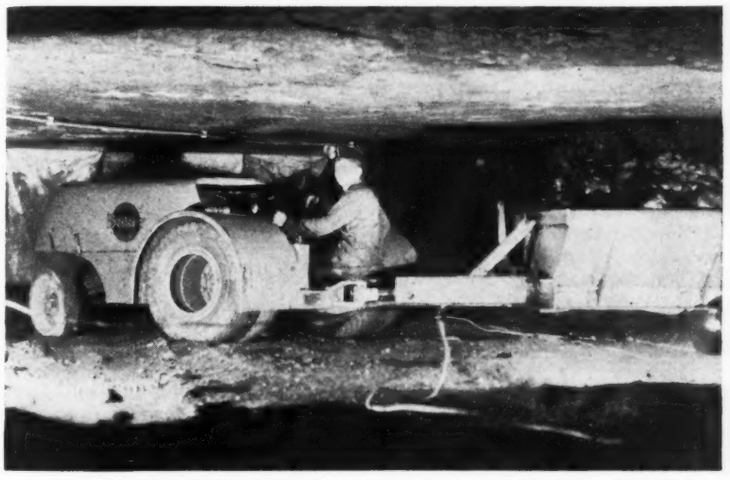
Cutting where done by the conveying crew took from two to five hours of the operating time of the man cutting when the conveyer was in continuous operation, explained J. O. Cree, West Virginia Engineering Co. When one machine cuts several places where the coal is 3 ft. thick and a 6-ft. cutter bar is used, the power consumed per ton by cutting machine ran 0.421, 0.348, 0.349, 0.500 and 0.409 kw.-hr. Actual demand at the motor generator would be perhaps twice that much. In every case, 200 volts or more was available at the machine, but untipped bits were used. Where four places were cut 20 ft. wide using alloy-tipped bits, the power demand per ton fell to 0.222 kw.-hr. On the other hand, Mr. Cree cited an instance where a machine cutting three places 30 ft. wide required 2.100 kw.-hr. per ton, but this was cutting both rock and coal. With an a.c. Sullivan Buddy machine cutting 40-ft. places, power consumption was 0.250 kw.-hr. per ton.

"Highballing" to Profits

RUBBER-TIRED haulage, storage-battery locomotives and better communication systems had the right of way in papers and discussions on underground transportation at Cincinnati. Three mines already using tractors and trailers behind mobile loaders have demonstrated the success of this gathering plan, declared J. H. Fletcher, consulting engineer, Chicago, who originated the idea. In this system, he explained, a haulage unit consists of a pneumatic-tired Baker storage-battery tractor pulling a two-wheeled double-tired trailer with drop-bottom doors. The haulage unit takes coal from a loading machine to a transfer hopper which includes a feeder and conveyor belt to deliver the coal into cars or onto an entry conveyor.

At the Blue Bird Coal Co., Saline County, Illinois, where the first installation was made, three tractors with six batteries, three 3-ton trailers and one 5-ton hopper with feeder and conveyor serve an 8BU Joy loader. A duplicate unit has been ordered for August delivery. At the Moffat Coal Co., Sparta, Ill., a 7BU loader working in 62-in. coal is served by the same type transportation unit. Hart Coal Corporation, Mortons Gap, Ky., has been using a unit of four tractors with eight batteries, four 3-ton trailers and one transfer station in 60-in. coal. Another unit of six tractors with twelve batteries, six

Rubber-tired tractor and trailer unit at Blue Bird mine



trailers and a transfer station is on order. A charging set with automatic control board also is part of the equipment making up a unit.

This rubber-tired haulage, Mr. Fletcher explained, was conceived as a means of increasing production with mobile loaders in seams where high-capacity mine cars cannot be used. Changes from track to rubber-tired haulage have resulted in increases of 50 to 100 per cent in loader performance. After hauling 70,000 tons of coal, said Thomas Schull, superintendent, Blue Bird Coal Co., in reply to a question, scarcely any wear is evident on the tires and no punctures have occurred on the tractors or trailers. As yet, stated Mr. Fletcher in answer to another question, diesels in place of batteries on the tractors have not been given serious consideration because of their weight and the likelihood of opposition to their installation underground; at some future date, however, they may be used.

Storage-battery locomotives are servicing loading machines effectively at the Castle Gate No. 2 mine despite the handicap of grades reaching 24 per cent, said A. C. Watts, general superintendent, Utah Fuel Co., in a paper read by L. D. Lamont, Philadelphia & Reading Coal & Iron Co. The coal bed is 24 ft. thick and 8 to 11 ft. is mined on the advance. Dust from the coal is highly explosive and a considerable quantity is produced in mining. Water sprays are used at the face and the rest of the mine is rock-dusted. The average length of run is 1,100 ft. and the gradients average 4 per cent in favor of the loads. Tonnage per car with mechanical loading is 3.8 tons; with hand loading it was 4.5 tons.

Locomotives are equipped with Exide 33-plate batteries; those purchased in 1934 and 1935 have Mipor rubber separators and are guaranteed for 54 months. Examinations of the batteries during the past few years have disclosed only small amounts of sediments and improvements by the manufacturer have further decreased sedimentation. Charging is done at constant potential rate; the generators, placed in fresh-air intakes, are protected by steel cases with automatic carbon-tetrachloride fire extinguishers. Battery-cell temperatures seldom exceed 85 deg. F., which is 25 deg. below that which might cause undue deterioration. Each battery is cleaned weekly, the water level is checked, and a boosting charge is administered.

Dispatching Boosts Tonnage

Production was boosted from 700 tons to 900 tons per day at one mine simply by installation of an adequate telephone system and paying a dispatcher $6 per day, said W. C. Thompson, New River Co., West Virginia, in pointing out the benefits of an adequate communication system properly utilized. The complete telephone system with stations at convenient and strategic points along haulways and at distances not more than ten minutes' walk from the most remote working place is the outgrowth of a long line of communication improvements. Speed in removing an injured man from the mine and power savings are among other important advantages of adequate telephone service.

The dispatcher's office should be equipped with a desk of top dimensions large enough for convenient handling of large report sheets; his telephone set should include a headpiece. A dispatcher may well be selected from men experienced in mine operations—particularly haulage—and, if he is a young man, he may be good foremanship material. A man who has served as a mine official but has become incapacitated for his former duties also may prove a good selection for the dispatcher's job. Strict discipline over all underground employees, Mr. Thompson warned, is necessary for profitable use of a dispatching system.

As to the cars necessary in a mine, a number one and one-half times that of the total men served was set forth as an approximate basis for comparison. Looking into the possibilities of the future, Mr. Thompson cited an experiment recently made in the Whipple mine with radio-principle carrier-current telephony. In this experiment communication was maintained for 15 minutes between locomotive and a telephone station above ground.

Saving Dollars—and Lives!

"COST is one of the most potent arguments that the true believer has for the cause of safety," declared Otto Herres, vice-president and general manager, United States Fuel Co., Utah, in a paper read at the Cincinnati convention by P. D. McMurrer, assistant mining engineer, American Mining Congress. No mine, he insisted, can afford to pay the price of working dangerously. The same note was sounded by Dan Harrington, chief, health and safety branch, U. S. Bureau of Mines; consumers, he said, cannot be made to pay the compensation costs of the careless operator because rival producers have cut prices to the bone and in so doing have given the buyer the benefit of the savings made in safe operation. So the unsafe operator must absorb compensation charges representing 10 to 15 per cent of the cost of production and so risk going "into the red."

How to instill principles of safe operation, however, is no mean problem. More and more it is becoming recognized, said Mr. Harrington, that management must have clean hands in approaching employees in its safety work; otherwise there will be no response. Management must first do all it can to make the mine safe. Workers have their preconceived ideas about safety and believe that accidents are inevitable. They read little about safety precautions or mining methods, know little or nothing of the trend toward safety provisions. Accustomed to oppose the operator in wage negotiations, they also oppose him when he seeks to conserve life and limb. Cooperation between management and men—a relation to be established between those who, in the past, were respectively drivers and driven—is achieved only with difficulty.

Letters signed by the superintendent and sent to all the men are one way to seek their cooperation, continued Mr. Harrington. Physical examinations may be resented by employees and union, but many operations have them and without them it is hard to see how safety can be attained. Every mine should have a fire-prevention program. It is luck, not provision, that has saved the mines, filled with combustibles and often inadequately freed of highly combustible wastes, from being the victims of extensive fires.

A million persons have been trained in first-aid work by the Bureau, said J. J. Forbes, supervising engineer, safety division, U. S. Bureau of Mines. Accident-prevention courses have been given mainly to mine officials; these courses have a total duration of 50 hours. Mine-rescue-training courses have brought instruction to 60,000 persons in the mining industry, and 500 chapters of the Joseph A. Holmes Safety

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Too High a Price

●"The price of working dangerously is more than any mine can afford to pay. Safety is merely operating in the proper manner—the application of common sense to mining. Good mining practice requires maintenance of equipment and machinery in good condition, employees competent to handle their work in the proper way, good tools, adequate supervision, progressive management, and cooperation. The fundamentals of good mining practice are the elements of safe operation. The average life of a coal property may be a generation or more. Without good practice, production costs cannot be kept low for any great part of this time, and yet only good mining practice can hold accidents to a low point.

"Most operating men probably do not feel that the sole approach to safety should be made on the basis of cost. Safety essentially involves human existence, and life is not a problem in mathematics. But, be that as it may, cost is one of the most potent arguments that the true believer has for the cause of safety." — Otto Herres, Vice-President and General Manager, United States Fuel Co.

Association have participated in safety meetings.

Accident costs—needless expenditures in a degree if safety practices became universal—made the Virginia Iron, Coal & Coke Co. institute a bonus system, asserted J. J. Sellers, vice-president. At first safety bonuses were restricted to assistant foremen and were given as a special check with forms resembling attached citations for merit to men who passed a whole month without a single lost-time accident. Such an accident was defined as one which kept a man away from work the next day after the accident had been incurred.

This system improved the record, but fell short of expectations. So the men with no lost-time accidents were made participants in the award system. To qualify, however, men must not only have a clear record but must also attend the safety meetings, at which drawings are held and the prize awards are made. Absence because of sickness is not accepted as an excuse, but absence for work at the mines is. Meetings are held in the daytime on a day when the mine is idle. This arrangement, said Mr. Sellers, has been enthusiastically received by the mine workers.

To get safety over to the men is no easy task, according to C. A. Stine, safety engineer, Stonega Coke & Coal Co. The newspapers they read do not give the subject space. Hope has been entertained, however, that the matter might be approached through the school children. While some of the men might not be interested in the bonuses offered in prize drawings, Mr. Stine felt that, if a sufficient number were interested, they would contribute that interest in safety to the rest.

Probing Underground

WHILE many of the discussions of mining methods were limited to changes necessary when mechanical loading is installed and are abstracted in the section entitled "Mechanization Pace Quickens," other phases of underground operation were not neglected in the program of the technical sessions of the convention. Pillar extraction, legal requirements respecting barrier pillars, drainage and dewatering, ventilation, and bit treatment were reviewed in special papers. Moreover, in keeping with the growing appreciation of the importance of coordinating all phases of operation to promote efficient production methods, many speakers traversed several fields in their presentations.

Methods of drawing pillars, based on narrow places and 100-ft. pillars in the Pittsburgh seam and using either open-end or splitting systems, were described by H. L. Griffin, division engineer, Koppers Coal Co. He foresaw the probability that metal roof supports would come into use and materially improve roof control. In one case, as a result of complete mining of the Pittsburgh bed, a single chain pillar in the Sewickley seam above it had sunk with the entire interval between the two beds, making it possible for a man to crawl over the Sewickley pillar between it and the sandstone.

Every mine should not only be protected by barrier pillars against the encroachments of squeezes, water and gas in other mines but also should be so sectionalized by such pillars that troublesome occurrences of that nature in one part of the mine would be localized, asserted C. S. Blair, vice-president, Black Diamond Coal Mining Co., Alabama. Many a mine in Illinois and Ohio recently had cause to regret that barrier pillars had not been left to protect their younger workings from incursions of water from older workings. Too intimately connected, they presented such a dewatering problem as to raise doubts whether the dewatering of the new operations could be effected with profit because the older workings also would have to be freed of water at the same time. In some instances it was more profitable to close down than to pump the vast quantity of water which had entered.

In Alabama the laws demand that each operator provide a 15-ft. barrier pillar around his property, but in Kentucky only 5 ft. is required. Pillars 10 to 30 ft. thick, such as these, are of value only in drift mines and probably only such workings were contemplated when the laws were drawn. In Tennessee and adjoining States, the law failed to stipulate that any pillar should be left. In the Pennsylvania statute of 1929, provision was made that barriers between properties never should be less than 20 ft. wide plus four times the seam thickness, plus 10 ft. for every 100 ft. of cover or fraction thereof. Probably the old rule of one-third the depth of the cover for the width of the barrier pillar was excessive and a waste of resources.

Consideration should be given to thickness and general character of seam and to cavernous limestone and slips in the roof, continued Mr. Blair. Faults sometimes conducted the water through pillars. Draw carried openings over the line of excavation and might open passageways from a mine across the property line, but such crevices might close after their occurrence, as sometimes had been observed. Water often will leak measurably through many hundreds of feet of coal, but there will be no dangerous incursions; in some cases, it would seem that more pillar had been left than needed to prevent a free flow of water, yet enough pillar hardly could be provided to prevent water from seeping along the passages nature had created. In providing pillars, one always must keep in mind the possibility of human errors in making surveys.

Every barrier problem needs solving in accordance with local conditions, declared M. L. Coulter, chief engineer, Clearfield Bituminous Coal Corporation, eastern Pennsylvania. Extraction of twelve beds of coal in the Northern Anthracite field, asserted J. M. Humphrey, Jr., engineer, Lehigh Valley Coal Co., involved an area from which 300,000 persons draw their sustenance and actual physical support. The March, 1936, flood which entered Hallstead colliery (*Coal Age*, September, 1936, p. 355) made the operators deeply conscious of the perils of flooding and led to an inquiry into the size of barriers existent over the area so that every operator would know the risks he was running of incursions of water from neighboring mines. Following the flood of 1865, many safeguards had been installed to protect shafts; one specifically mentioned was the stone wall erected around the shaft and under the headframe at Seneca.

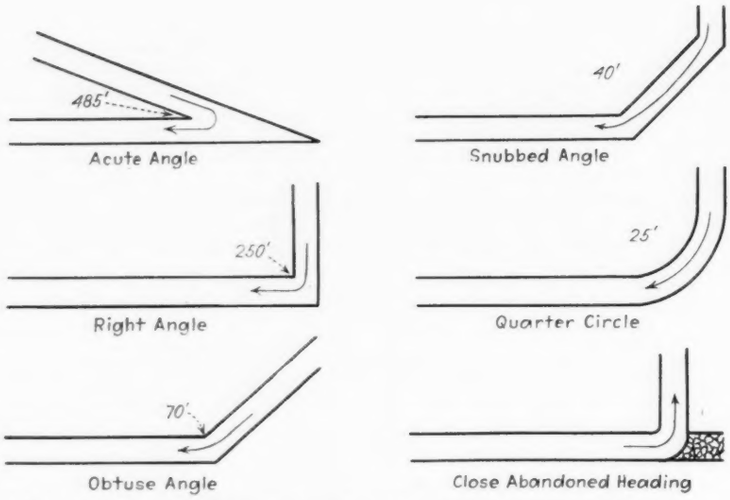
Selection of horizontal centrifugal pumps instead of deepwell turbine pumps, declared A. B. Kelley, general manager, Humphreys Coal & Coke Co., would be on a par with substituting an ox cart for a motor truck. In dewatering an abandoned field in Westmoreland County, Pennsylvania, four 16-in. 3-stage 350-hp. deepwell turbine pumps installed in a shaft handled 2,500,000 tons of water in 46 days. The coal-seam elevations range from 980 to 1,080 ft. above sea level; the surface of the water stood at 1,040 ft. and had to be pumped down below 980 ft. Maximum lift on the pumps was 200 ft.

Acidity Cut Sharply

At the start of the job the acidity and alkalinity in parts per million were as follows: discharge, 3,420 acidity; surface of water, 110 alkalinity. At the finish of the dewatering the figures were 1,670 and 70, respectively. Toncan steel coated with bitumistic or equal and other acid-resisting parts were used. The Commonwealth of Pennsylvania, added Mr. Kelley, has purchased three Sterling pumps (the same make used at Humphreys) to start in July on the job of lifting 45,000,000,000 gallons of water from an abandoned field. These pumps are each rated at 4,000 g.p.m., 450-ft. head, and are driven by a 600-hp. motor.

He could not recommend the deepwell turbine pump too highly for mine dewatering service, said W. L. Affelder, vice-president, Hillman Coal & Coke Co., Pennsylvania. Three years ago he used one at a cost of approximately $3,000 to pump a flooded mine; had a horizontal centrifugal pump and the necessary piping been purchased for that job the outlay would have exceeded $30,000.

Calling attention to the fact that 1937 marks the fifteenth anniversary of the birth of the idea of automatic control



Equivalents of turns of current to feet of straight airway. Where current is diverted from dead end to side airway, mouth of old entry should be filled tightly.

of centrifugal mine pumps, E. B. Wagner, electrical engineer, Lehigh Valley Coal Co., proposed four refinements to the controls now in common use, as follows:

1. A timing relay to continue operation of the vacuum pump until all air is eliminated from the water lines, thus insuring against the possibility of failure in case a second start is necessary to bring the pump to normal operation.

2. An electrode substituted for the float switch. Twelve months' trial of this device points to definite improvement in reliability.

3. Use of an electrode to displace the float in the vacuum breaker would eliminate the often troublesome feature of the close adjustment that field maintenance men are required to make.

4. A mercury switch fastened to the check-valve hinge rod to insure contact operation with slight change of angle, simplifying adjustment.

With customary high-speed ventilation, declared H. Landsberg, geophysical laboratory, Pennsylvania State College, in a paper read by Prof. W. R. Chedsey, an approach to streamlining of airways is essential. A turn around an acute angle gives a resistance equivalent to travel along 485 ft. of straight airway, around a right angle one equivalent to 250 ft.; around an obtuse angle is equivalent to 70 ft. of rectilinear airway, one around a right angle radial turn to 25 ft.; one around a right angle with the point of the angle snubbed off at 45 deg. and both sides parallel is equivalent to 70 ft. When a heading is turned off another heading, travel along which latter is discontinued, the end of the straight heading beyond the turn should be closed and the outer turn rounded so as to carry the air with minimum resistance around the turn.

In the average mine, said A. Lee Barrett, Pittsburgh Coal Co., 25 per cent of the power bill must be charged to ventilation. With proper provision, this might readily be cut to only 10 per cent. But low-speed currents are necessary as well as streamlining. The mine must be planned at opening so that it will be ventilated with economy not only while it is new but also when it reaches its ultimate limits. Care must be taken to provide for short-line ventilation, which will not only decrease resistance but reduce leakage. Only 10 per cent of the resistance usually is due to skin friction along the coal ribs; turbulence in air flow is the cause of the other 90 per cent of loss.

An obstruction in the airway, continued Mr. Barrett, produces turbulence on its far, or downstream, side and the whirling motion thus set up may—and often will—set up other air maelstroms besides the one which forms immediately back of the obstructing object. If a stopping is built in a crosscut back of the rib line, the stopping should be placed so near the edge of the rib that the air will whirl but once between the rib line and the stopping. An adjustable pitch propeller blade has been designed which will make a fan suitable for the demand in all stages of the mine's development. Recognition that air had resistance which enabled it to prevent the falls of objects and which required power to maintain it in motion, observed J. F. Callbreath, secretary emeritus, American Mining Congress, is a development of modern growth.

Experiments with hard-tipped bits, declared F. F. Jorgenson, production manager, Consolidation Coal Co., is quite varied and depends on seam conditions. Sometimes no improvement in cutting results; in places, hand-made bits are preferable to machine-made. Star-pointed bits sometimes are used where bugdust is dumped to waste. Duplex bits have been giving quite promising results. In places there is 8 per cent less minus ¼-in. material in the machine cuttings as a result of their use and 7 per cent less minus ¼-in. material; the saving in power has been 10 to 15 per cent. In some instances 7-position chains have been replaced by 9-position, but without any great advantage.

Research Points the Way

INDUSTRY, asserted John C. Cosgrove, president, Bituminous Coal Research, Inc., has the choice of controlling research costs by financing its own program or of facing unpredictable and uncontrollable costs—and losses—by not engaging in research. A few years ago, he continued, the bituminous industry, under the leadership of the National Coal Association, organized its own research agency with broad powers to pursue studies in all phases of coal production and distribution, and to acquire, manufacture and lease manufacturing rights for production and combustion equipment.

Believing that the first step in the program of applied research should be directed toward the protection of existing markets, the operators' agency has been utilizing the facilities of Battelle Memorial Institute in studies of household heating problems. Another project under way is a cooperative study of the actual combustion of coal on the grates in large industrial plants. Looking to the future, Bituminous Coal Research, Inc., is supporting research in hydrogenation at Pennsylvania State College. Present supplies of oil and present costs of hydrogenation may make this investigation seem academic to some, but, said Mr. Cosgrove, the future of oil reserves is uncertain and no one should be bold enough to say that hydrogenation costs may not be reduced.

Combined expenditures by all agencies engaged in coal research work, stated Howard N. Eavenson, consulting engineer, is less than $500,000 annually. Great Britain and Germany, with smaller production, spend 50 and 75 per cent more, respectively; South Africa has appropriated £90,000 for research in hydrogenation alone next year. One American oil company spends $2,000,000 a year in research work and the oil industry as a whole probably spends fifteen to sixteen times as much as coal. Considering the economic position and the value of its product, an annual expenditure of $800,000 to $1,000,000 for coal research would be very modest. Mr. Eavenson urged that an attempt should be made to enlist Congressional aid for research through the National Bituminous Coal Commission.

While there might be a number of new uses for coal which would absorb 100,000 to 150,000 tons, Mr. Eavenson could see none in the immediate future which would consume a substantial ton-

nage. The main objective, therefore, should be to win back some of the markets lost to competitive fuels. He estimated the losses to oil and gas as somewhere between 150,000,000 and 225,000,000 tons. If research enabled the industry to recover even 50,000,000 or 60,000,000 tons of this business, the contribution to improvement would be a noteworthy one.

Because of the popular demand for automatic as well as comfortable heating and the great strides made in small-stoker sales, a large part of the work at Battelle Memorial Institute, said Ralph A. Sherman, fuel engineer, has been devoted to a study of the burning characteristics of coal with relation to the stoker. As a result of studies in crushing, 1¼-in. coal was recommended as the top size for stoker use. Detailed study also was made of the flow of coal and behavior in the stoker. Results of burning tests with different sizes of coal will soon be published.

Closer Cooperation Won

One important byproduct of these studies has been the development of greater cooperation between stoker manufacturers and coal producers. Both recognize, however, that there still are problems to be solved. More light is needed on coke-tree formation. The failure of ashes of certain high-grade coals to clinker, particularly in mild weather, also demands further investigation. If coal is to meet the competitive situation fully, declared Mr. Sherman, the stoker must be truly automatic. One large producer is now marketing a bituminous stoker which removes the ash, but limits the equipment to use with its own coal; several manufacturers also are working on the problem of automatic ash removal.

About five years ago, explained Dr. A. W. Gauger, director, Mineral Industries Research, Pennsylvania State College, the National Research Council granted a fellowship—the only one ever given by it for coal—to his colleague, Dr. Wright, for fundamental research in hydrogenation. Experimentation had demonstrated that approximately 90 per cent of certain coal material was soluble at temperatures below 270 deg. C., or less than the ordinary temperatures of decomposition. Fourteen samples of Appalachian and Illinois coals have been hydrogenated, but no method yet has been found for the hydrogenation of the fusain content. The percentages of different banded materials, said Dr. Gauger, are important in the selection of coals for hydrogenation.

Studies at the coal research laboratory of Carnegie Institute of Technology, according to H. C. Howard, assistant to the director, have been concerned with the nature of bituminous coal and the various physical and chemical changes it undergoes in carbonization, combustion and hydrogenation. In carbonization, rates of heating and maximum temperatures have marked effects on the character of the char, hardness of the coke and the richness of the gases evolved. This is particularly true in the "sensitive range" as distinguished from the entire heating range. Turning to new uses, Mr. Howard emphasized the importance of synthetic resins. Coal men, he remarked, fear that new uses will not offer big enough markets; chemists worry about the adequacy of the supply of raw materials for the production of synthetic products.

Because Illinois coals are "relatively" low in rank, said Dr. M. M. Leighton, chief, Illinois Geological Survey, research in that State has sought to take advantage of the possibilities of separating and screening of fusain and other components. There is, for example, an increased percentage of fusain in dust, of clarain in large coal, and of vitrain in the finer sizes. Actually, therefore, what are commonly considered different sizes in reality are different coals with different problems of utilization. Dedusting of a given size may result in higher quality because of the elimination of some of the fusain from the dedusted coal. Classification by rank must be supplemented with classification by type, since coals of same rank may not give the same combustion results because of variation in percentages of components.

Briquets with a smoke index less than one-half that of Pocahontas have been made from Illinois coal. Dr. Leighton indicated still greater possibilities, however, for Illinois coke for domestic purposes as pure-air demands grow. Some of the older, discouraging experiments with carbonization, he added, had been made with "stale" coal and from face samples. To coke successfully, Illinois coal must not be more than two weeks old. Mine-run or face samples may not yield good results because of the varying percentages of component constituents found in such samples.

How research has been given concrete application in sales-promotion work was described by J. E. Tobey, manager, fuel engineering division, Appalachian Coals, Inc. Although coal actually is burned under many adverse conditions, "the excessive turnover of coals in power plants should serve as an indication that all is not well" and as a spur to more intensive study of coals and coal-burning equipment. One of the earliest jobs undertaken by ACI, therefore, was an industrial-plant survey in the States served by member mines. This survey covered nearly 15,000 boiler units by types, average horsepower and consumption per rated horsepower. Simultaneously mining engineers made a detailed study of operations at member mines in over 80 seams. Among other things, this second survey showed that minus ⅜-in. coals averaged higher in quality than had generally been thought and also gave the size-consist of nut-slack coals.

Another commercial research activity has been the establishment of fuel engineering conferences participated in by producers, consumers, equipment manufacturers and consulting engineers. Approximately 30,000 copies of the proceedings of these conferences have been distributed. In addition, continued Mr. Tobey, 200,000 copies of other engineering publications have been distributed; the fuel engineering division has acted as a consultant for producers, consumers and manufacturers, cooperated with public and private fuel agencies and engineering societies, and has helped in combating oil, gas and hydro competition.

Fine Points in Cleaning

REFINEMENTS in preparation practices, with special emphasis on drying and dust-treating, featured discussions of cleaning problems at the Cincinnati convention. Alabama, where washing long has been the general rule, offered two papers covering general progress in the State and the methods used at one of the larger companies serving the byproduct coke market. Strip mines—pioneers in mechanical cleaning in the Middle West—contributed to the review of heat-drying developments and also presented the story of one of their newest preparation plants. The difficulties of satisfying consumers who insist on judging quality by appearance were outlined by the anthracite section.

In figuring moisture in coal during drying tests it has been the practice to deduct the known inherent moisture from the total moisture and designate the remainder as surface moisture. Such figures as T. W. Guy, consulting engineer, Charleston, W. Va., gave in opening a symposium on cleaning problems the closing day of the convention referred to such moisture. Surface moisture percentages, as he showed by chart, were reciprocal of the size of the particles wetted—large coal, low surface moisture; small coal, high surface moisture.

Coal is heated but little, declared W. H. Price, Delta Coal Mining Co., when gases originally at 950 deg. F. are passed through a bed of it in a Link-Belt Roto-Louvre dryer because they travel through the bed so fast that the only affect they have is to evaporate the water. If they should heat the coal, it is because the bed is too deep. No gases enter the louvre cylinder except where there is coal to dry. The louvre revolves at 1.8 r.p.m. and the coal does not cascade, so there is no degradation. After passing through the coal, the gases leave at temperatures below 175 deg. F. Drying coal prevents freezing, enables the producer to bring the water content down to the railroad's moisture tolerance for shipped coal, permits him to put more coal in the car and ship a product with a higher B.t.u. content.

Alabama has been a leader in preparation since 1890, when it began ex-

Moisture of Coals Dewatered by Various Methods

Size of Coal (Inches)	Manner of Dewatering	Percentage of surface water remaining
	Coal reasonably free of minus ¼-in. material	
1½ to 4½	Conveyors, elevators, gravity screens, shaking screens and vibrating screens	0.3 to 3.0
½ to 1½	Conveyors, elevators, gravity screens, shaking screens and vibrating screens	1.8 to 5.5
	Coal which includes ¼-in. material	
3/16 to ¾	Elevators and screens	10.0 to 19.0
0.1875 to 0.375	Centrifugal dryer	4.0 to 7.5
0.1875 to 0.375	Evaporation	1.5 to 5.0
	Fines from wash water	
0.023 to 0.185	High-speed screens	18.0 to 45.0
0.008 to 0.023	Vacuum filters	18.0 to 22.0

perimenting with the Luhrig jig, and subsequently introduced the Robinson washer with still later improvements made by an Alabaman, Erskine Ramsay. Today, stated B. W. Gandrud, supervising engineer, Southern Experiment Station, U. S. Bureau of Mines, the State has extensive jig equipment of various types and reciprocating tables, but no other forms of washing equipment. While there is no froth flotation, the need for it in treating the smaller sizes seems to be indicated. No heat dryers are used, but at least one mine has Elmore certrifugal equipment. Most Alabama coals present many cleaning difficulties because of the presence of bone. At one mine, however, absence of that impurity makes it possible to produce a coal with 2-per-cent ash, while a 14-per-cent ash may be expected in the Mary Lee bed; other coals range between these two extremes.

Fortifying Mr. Gandrud's dictum, the Mary Lee seam with its flaky rash that has a gravity not much greater than than of coal, said H. J. Hager, preparation superintendent, Alabama By-Products Corporation, is the most difficult to clean. In making a high-grade foundry coke, Mary Lee, Black Creek and Pocahontas coals are mixed. With a Bradford breaker, Deister-Overstrom diagonal-deck tables and swing-hammer pulverizer, however, coal that makes a good product is prepared.

The fine coal obtained by dedusting, declared Henry F. Hebley, coal preparation department, Commercial Testing & Engineering Co., is being used by some concerns for pulverized-coal furnaces without further grinding. If the gases are to be heated before dedusting, so as to dry the coal and thus render it more susceptible to separation by sizes, their decreased weight must be considered or it will be found that they are of inadequate density to raise the maximum size of dust that it is desired to remove. Coal fed to a deduster should not contain more than 4.0 per cent of moisture.

Consumers have different views of what oil-treated coal should be like, asserted M. H. Forester, manager of preparation, Consolidation Coal Co. Some would like so much oil sprayed that the coal after being exposed to a rainstorm will acquire no increase in the "as-received moisture." Two gallons of oil per ton of coal may be required to meet such a specification, as against 3 to 6 quarts for normal treatment. Whether to use a low-gravity oil at a low temperature or a high-gravity product at a high temperature is still a moot point. The temperature of oil received last winter was about 45 deg. F.; when stored the temperature became that of the atmosphere.

Oil used intermittently, continued Mr. Forester, clogs the spray nozzle and causes trouble when the flow is suspended. Dusty coal presents an explosion hazard and oil a fire hazard, but oil spraying seems to have the better of the argument from the safety standpoint. Oil has been used to keep water from coal in washing. Oil treatment, concluded Mr. Forester, has come to stay. "Fifty per cent of our fine coal," added Glen A. Knox, general superintendent, Gunn-Quealy Coal Co., Wyoming, "is oil-treated."

"Waxolized" treatment, declared Thomas C. Cheasley, Sinclair Coal Co., at whose mines in the Midwest and Southwest this treatment was developed, offers removal of dust nuisance, lower cost than straight oils, a film of high adhesive properties which controls moisture content of the coal, a slight lubricating effect instead of corrosive action, and reduced degradation. The Waxol fluid—a crystalline wax blended with oil—is applied by high-pressure sprays in a treating box at approximately 165 deg. F. Mr. Cheasley asserted that this treatment forms a durable, odorless coating over the entire surface of the coal, regardless of moisture conditions and without absorption.

Moffett

William E. Goodman

William E. Goodman, Goodman Manufacturing Co., was elected chairman of the board of governors of the Manufacturers' Division of the American Mining Congress at a meeting of the board in Cincinnati May 18. He succeeds Bruce G. Shotton, Hendrick Manufacturing Co.

Roy L. Cox, Jeffrey Manufacturing Co., was advanced to the post of first vice-chairman of the board; Frank E. Mueller, Roberts & Schaefer Co., moved into the second vice-chairmanship, and A. S. Knoizen, Joy Manufacturing Co., was elected third vice-chairman.

Experiences of the Butler Consolidated Coal Co., Pennsylvania, with wax treatment were described by P. W. Edeburn, preparation manager. At the start of experiments, three years ago, 9 to 10 lb. of wax with a melting point between 122 and 124 deg. was applied per ton of coal. Later this was reduced to 5 to 6 lb. and the lower limit for stoker coal was set at 4 lb. per ton. Tests were made in February, 1936, spraying at 80 deg. C. and 450 lb. pressure, but the results, while fairly satisfactory, were not as good as with hot-water applications. Last September treatment of mine-run prior to screening was tried; 23 to 25 lb. of petrolatum (105 to 110 deg.) was applied per ton of coal to the undersize on the mine-run screen by sprays below the deck. A 75 to 80 per cent reduction in fly dust resulted and the efficiency of application of the wax was 60 to 70 per cent.

The presence of horsebacks and white top (soft shale) was responsible for the decision to crush to 6 in. and wash the entire output of the new strip mine of the Little John Coal Co., Illinois, explained R. G. Baughman, chief engineer, Central Indiana Coal Co. Two Jeffrey Baum jigs and a D-L-O dryer with the necessary auxiliaries constitute the 5-track plant. If desired, all coal can be reduced to 1¼-in. screenings by a secondary crusher. Daily output has reached 3,000 tons in seven hours' tipple operation. The Little John plant was described in detail in the preceding issue of *Coal Age*.

Appearance Demands Costly

Meeting appearance demands which take into consideration such factors as color and shape and which have nothing to do with burning qualities is responsible for excessive costs in anthracite preparation, said W. H. Lesser, electrical and mechanical engineer, Pierce Management. The hard-coal industry has installed equipment and processes to turn out a high-grade product but faces a demand for a product of still better quality and appearance. This demand, no doubt, can be met, but the plant investments involved may not be justified by the sales realizations from that super-product.

Refuse in the coal as delivered to the breaker, continued Mr. Lesser, ranges in size from lumps weighing 2,000 lb. down to dust, depending upon the type and location of the mine. The refuse volume usually is between 10 and 50 per cent of the content of the mine cars.

Broken and egg coal are declining in tonnage each year and during certain seasons it now is necessary to break down the egg to smaller sizes. Chestnut and the three larger sizes bring prices above the cost of mining, but the five smaller sizes are sold at less than production cost.

Both realization and percentages of larger sizes have been falling: back in 1921, prepared sizes were 67.4 per cent of the total shipments of freshly mined coal; last year the proportion was 51.6 per cent, but these sizes contributed 68 per cent of the realization. Mr. Lesser saw opportunities for marked economy if sales and production departments could agree upon what constitutes "marketable" coal. If the appearance factor could be eliminated, the cost of repreparation would be reduced materially.

Power Problems to the Fore

ALTHOUGH the convention program included only four papers specifically limited to electrical-distribution and power-generation questions, the topics treated ranged from understandable redefinitions of such basic terms as load demand, load factor and power factor to the use of mercury-arc rectifiers in coal-mining service. The proposal that producers could encourage the consumption of coal in private power plants by generating their own power at the mines again was stressed. Advantages of sectionalizing power by the use of automatic circuit breakers also were discussed.

Electrical demand, quoted M. W. Horgan, mining representative, Monongahela-West Penn Public Service Co., is defined as the load drawn from the source of supply at the receiving terminals averaged over a suitable and definitely specified period of time. That period may be 15 minutes or less. A study of industrial loads in general has shown that if the demand factor for one hour is taken at 100, the same factor for 30 minutes will average 107.7 per cent; for 15 minutes, 113.2; for 10 minutes, 115.2; for 5 minutes, 121.0; for 2 minutes, 124.7, and for instantaneous load, 148.5 per cent.

What Is "Load Factor?"

Load factor, he added, is average power divided by maximum power based on a definite period of time. Colloquially, it may be expressed as the percentage of power used to what might have been used had all the motors installed been working concurrently at rated capacity. It is clear that, if a public utility was asked to provide for the use of 5,000 kw. for only one hour in the day by a single consumer, it would have to install a large capacity as compared with the trifling daily consumption of that customer, and for this it is right that he should pay at a higher rate.

Similarly, stated Mr. Horgan, power factor is true power in watts as measured by a wattmeter divided by apparent power. Alternating current has the peculiar characteristic of creating magnetizing or wattless current. Like the foam in a stein, the wattless current has no substance, but it demands capacity just as the foam demands space. For providing, so to speak, a larger stein to hold the foam, the public utility or the private self-supplier must expend more money. Or, continued the speaker, if one horse in a team rears forward and the other pulls backward at the same instant, there is no progress. Name the first horse "volts," and the second "amperes," and the progress of the carriage which the horses are drawing "watts." You will have no progress in one case and wattlessness in the other.

An electrician had a power factor of 70 and was running three rotary converters over-voltage. When he was told that this was wrong, said Mr. Horgan, the electrician replied that the lamps in the tipple would not give any light if he didn't do it. But he learned that by buying lamps of higher wattage he could run the rotary converters at the right voltage and improve his power factor. Further exposition of these terms along similar lines was contributed by L. W. Bates, Appalachian Electric Power Co., in a discussion of Mr. Horgan's paper.

With electronic development, stated A. E. Lee, consulting engineer, Pittsburgh, Pa., has come the Ignitron, which has lowered the capacity needed to render rectification feasible. To start the rectification, no heavy machinery has to be put in motion. With such equipment, it is desirable to have the rails the positive conductor and use the trolley wire as the negative. The Weirton Coal Co., he added, plans to use Ignitron equipment at its Isabella plant.

Outstanding Simplicity Achieved

More and more complication, said A. Lee Barrett, Pittsburgh Coal Co., is commonly declared to be the concomitant of modern machinery, but the new rectification equipment is of almost unbelievable simplicity. The mercury-arc rectifier can be erected for one-third the cost of mechanical rectifying devices, and the equipment can be dismantled and relocated in two days at a cost of about 8 per cent of that of the original installation. Efficiencies exceed those which can be obtained with motor-generator sets or rotary converters. In the Pittsburgh Coal Co. installations (*Coal Age*, February, 1937, p. 78), only the rectifier is placed inside the station; transformer and intercooler are located outside. Prestone makes the rectifier all-weather equipment. Each month a saving of 2.2 per cent of the cost of the rectifier is made over the cost of operating the mechanical equipment it replaced.

If the coal industry would extend the practice of generating its own power requirements at the mines, asserted C. M. Garland, consulting engineer, Chicago, other industries would be encouraged to generate power and thus bring back the isolated plant with its greater demand for coal. As it is now, the industrial load has gravitated from the old isolated plant with its fuel requirements of 2½ to 8 lb. of coal per kilowatt-hour to the large central stations which use less than 1 lb. of coal per kilowatt-hour.

A power plant built two years ago adjacent to a mine of the Sherwood-Templeton interests at Linton, Ind., and controlled by those interests, has demonstrated its reliability and ability to earn a satisfactory return on the investment. Equipment consists of three 500-hp. boilers with Coxe chain-grate stokers and three turbo-generators of 1,000, 2,000 and 3,000 kw., respectively. Slurry containing as much as 24 per cent water and 23 per cent ash is the fuel burned 90 per cent of the time. When an aid to maintaining an open fuel bed is required, screenings are mixed with the slurry. In addition to furnishing mine power the plant also supplies the city of Linton and the plant load already has increased to 50 per cent above rated capacity.

Over-all Costs 0.35 to 0.75c

Mr. Garland placed over-all costs per kilowatt-hour at mine generating plants in the range from 0.35 to 0.75c. One plant which cost $500,000 saved $140,000 per year over purchased power costs. The costs at the plant using slurry as a fuel are 0.6 to 0.7c. per kilowatt-hour.

Twenty automatic reclosing circuit breakers used in the Wheelwright mine of the Inland Steel Co., in eastern Kentucky, are an important factor in maintaining a continuous power supply and afford the best known protection against the possibility of electrically started mine fires, according to John T. Parker, superintendent. The present equipment of breakers—all of one type and of a tripping range between 400 and 1,600 amp.—is the result of normal extension of mine working since 1931, when ten breakers sufficed for protection of the mine circuits. Installation follows a definite plan by which each breaker serves three locomotives and the mining machines working in that territory.

Wheelwright mine is in the Big Sandy-Elkhorn field, produces 5,300 tons per day from 43-in. coal, and the workings cover an area of 15 to 16 square miles in which 40 to 50 miles of track is maintained. Direct-current power at 275 volts is supplied by five substations; one is at the drift mouth, the others are near the load centers. Two of the substations have full-automatic control and three have automatic d.c. breakers only. Both motor generators and converters are used; the total installed capacity is 1,350 kw., of which 950 kw. is kept in

constant service. Power is purchased and the maximum average monthly demand is 1,350 kw.

Distances from sidetracks to tipple, continued Mr. Parker, average 2 miles. Cutting and loading are done on alternate shifts. While no attempt is made to limit the load on a breaker circuit, breaker settings are adjusted close to the normal maximum power required by the equipment served. Operation and settings are checked by short-circuiting the line at the farthest point. Cases are kept locked to prevent tampering with the breaker settings. Mechanical protection is afforded by the standard mine-duty case supplied by the manufacture.

MECHANIZATION EXPANSION

+ Reflected in Mining Equipment

Offered at the Cincinnati Exposition

NEARLY 150 manufacturers and service organizations offered equipment and services for mechanizing mine operations and increasing efficiency in the biggest equipment display in history at the Fourteenth Annual Convention of Coal-Operating Men and National Exposition of Coal-Mining Equipment, held at Cincinnati, Ohio, May 17-21, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress. Higher output per unit from both thick and thin seams, improved quality of the shipped product, longer machine life and reduction of mining hazards were the major points stressed for the various items of equipment offered for all phases of mining, preparation and safety.

GREATER output per unit, or extension of the principle of mechanization of mining and loading into hitherto untouched territory, was the major objective of equipment and auxiliaries for these activities shown at Cincinnati. "Stoody" hard-surfacing material for lengthening the life of cutter and auger bits, machine parts, etc., was displayed by the Air Reduction Sales Co., New York. In addition to other grading and earth-moving equipment, Austin-Western Road Machinery Co., Aurora, Ill., stressed pictorially a 12-cu.yd. hydraulic scraper and "Giant" ripper. Hollow drill steel was shown by the Bethlehem Steel Co., Bethlehem, Pa.

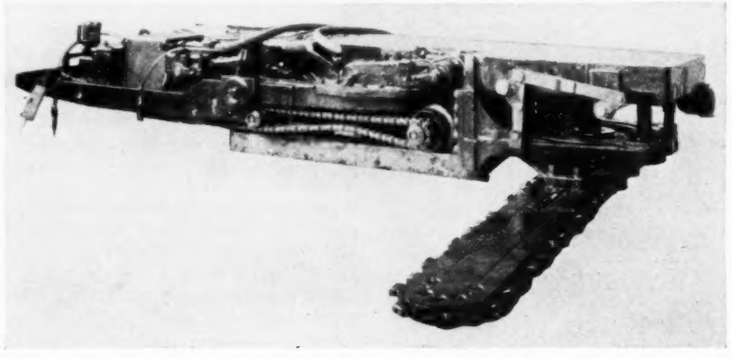
Bowdil cutter bits, detachable auger bits, cutter chains, cutter bars and sprockets and the Hardsocg "Humdinger" post-mounted electric coal drill with safety thread-bar sleeve and loose collar for handling thread bar and auger were displayed by the Bowdil Co., Canton, Ohio. Stripping shovels, loading shovels, Bucyrus-Armstrong drills and Bucyrus-Monighan walking draglines were presented in pictures by the Bucyrus-Erie Co., South Milwaukee, Wis.

Portable hand-held and mounted electric coal drills in both open and approved types; "Power-Vane" rotary hand-held air-driven coal drills weighing 27 lb.; a boxing assembly fitted with a liner which can be engaged and disengaged while the thread bar is rotating; one-piece "twisted-steel" augers; special auger cutting heads; a new-type post head bringing the drill to within 3 in. of roof or bottom; safety sockets and portable electric and pneumatic drills, nut runners, hammers and grinders for shop and repair work were displayed by the Chicago Pneumatic Tool Co., New York.

The "Duplex" bit-making machine for turning out an average of 400 "Duplex" cutter bits from bar stock per hour was offered by the Cincinnati Mine Machinery Co., Cincinnati, Ohio, along with "Cincinnati" thin-kerf cutter bars machined from solid heat-treated alloy-steel plate, "Duplex" cutter chain, regular cutter bars of heat-treated alloy-steel plate and chains to match.

For low coal and narrow places, as well as the usual type of cutting, the Goodman Mfg. Co., Chicago, offered the new 924 mounted bottom cutter with a height of 24 in. over the rail. This machine has a vertical range of from 5 in. below to 3 in. above the rail. Cutting speed is 21 to 36 in. per

Goodman 924 mounted bottom cutter



minute. All bar motions—tilting, vertical adjustment and swing—are made by power. Two swinging speeds are provided and the bar has a total swing of 203 deg. at any height in the vertical range.

The G-12½ shaker conveyor drive with a conveying capacity of 21 to 39 tons per hour and power to handle up to 350 ft. of trough where grades are level and conditions are average was another Goodman offering. Height, drive arms up, is 24¼ in.; arms down, 18 in. Other specifications are: width, without motor, 38 in.; length, 67 in.; trough size, 0-1; weight, without motor, 2,150 lb.; strokes per minute, 75, 79 and 86; and length of stroke, 7⅛ to 4⅝ in.

Goodman also displayed the Type 97 belt conveyor, which it described as a light-weight, reversible troughed belt conveyor for coal, rock and slate in mines where uneven bottom is encountered and close posting is necessary. The conveyor is composed of a drive section (with power unit), head section, standard sections, intermediate sections, telescopic section and foot section, and is available in widths from 26 to 36 in. and lengths up to 1,800 ft. Features cited by the company include: split covers for return belt to facilitate handling in narrow places; overlapping covers to cover return belt completely; adjustable roller supports for effective belt training; hook-and-button fasteners between sections to keep conveyor in alignment yet permit it to follow irregularities in the bottom; and remote delivery by reason of the fact that the drive can be placed anywhere along the conveyor with a detachable jib at the discharge point. Other Goodman products were the 412 and 512 shortwall cutters, 90S elevating conveyor, 91E transfer conveyor, L1B duckbill loading head and the 260 mobile track loader.

Haynes "Stellite" for hard-surfacing cutter bits was stressed by the Haynes Stellite Co., New York.

New cutters were a major feature of the display of the Jeffrey Mfg. Co., Columbus, Ohio. Included was the 29-U universal track-mounted cutting machine with hydraulic adjustments and feeds controlled by six valve handles. The machine will undercut, centercut, topcut and shear anywhere within the range of its adjustments. Cutter head and drive assembly is mounted on a turntable over the truck and the cutter bar in turn is pivoted about its chain sprocket shaft. This double-pivot arrangement of feed and swing, according to the company, is not only advantageous in cutting but also in getting around timbers and curves. Two motors are provided, one operating the cutter chain and the other the pump for the hydraulic system and, through clutches, the high-speed tramming mechanism and automatic cable reel. Sumping is done with a hydraulic motor, with a second such unit for rotating the cutter bar. Hydraulic cylinders perform all other movements.

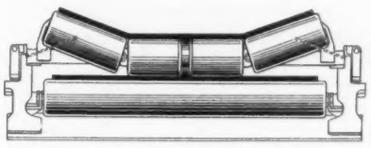
The 35-C shortwall cutter for use in conveyor-mining sections where trucks are not necessary was another new Jeffrey product. Equipped with a 20-hp. motor, the machine has feed speeds of 34 in. (standard) or 23 in. (slow speed) per minute. Handling speed is 26 ft. per minute. Two power drums, one on each side, are provided, and the over-all height is 24½ in. The cutter is available with either 4-in. thin- or 5½-in. standard-kerf cutter bars in various lengths. Jeffrey also showed the new 24-L combination longwall-shortwall cutter built in three sections and equipped with two power drums, 50-hp. motor, contactor control and ratchet feed for variable feed speeds. Over-all height is 15 in.

Jeffrey 29-U universal cutting machine

The 44-L long-face loader, also adaptable to wide rooms, was another new Jeffrey product. This loader is pulled along the face like a shortwall cutter and is designed for use with a conveyor for transportation. Two power-driven rope drums are provided for each direction of advance, and the loader can be controlled from either side. It is equipped with a 10-hp. motor and a reversible chain. Over-all height is 19 in.

Other Jeffrey products on display were the L-400 track-mounted loader, 61-HG face conveyors, 61-AM room conveyors, 61-EA elevating conveyors, belt conveyors and equipment, the 35-BB standard and 35-L low-vein shortwalls, and A-6 post-mounted and A-7 hand coal drills.

In addition to 7-BU, 8-BU and 11-BU loaders, and chain and belt conveyors,



Link-Belt "Center-Guide" belt conveyor

Joy Mfg. Co., Franklin, Pa., offered the new low-pan Joy, Jr., loader for thin seams and conveyor transportation. Height of the conveyor pan on this machine is 17 in. Over-all height is 26 in., and under certain conditions the loader will operate in 30-in. coal. Guaranteed loading rate is ¾ ton per minute. Controls are centrally located to facilitate one-man operation. Joy also offered the "PL-9" portable conveyor with rubber-tired casters for serving both Joy, Jr., and 8-BU loaders in low-seam mining. Of the chain type, the unit is said to be especially adapted to loading out crosscuts and long faces, and may be used with Joy chain conveyors as an extension unit. Conveyor length is 25 ft.; width, 21 in. The conveyor is split in the center to permit insertion of another section.

For transporting the cutting machine independently of tracks and without the use of ropes, Joy offered the new "T-1" mining-machine truck, consisting of a tilting table mounted on a caterpillar chassis. To unload the cutting machine, a jack pipe is set between the machine and the roof and the truck then is backed out from beneath the cutter. When not transporting the cutter, the truck may be employed for moving conveyor drive heads and miscellaneous equipment and supplies. Equipped with a 300-ft. trailing cable, the truck has a normal average traveling speed of 100 f.p.m. Height to pan base is 18 in.; weight, 4,000 lb.

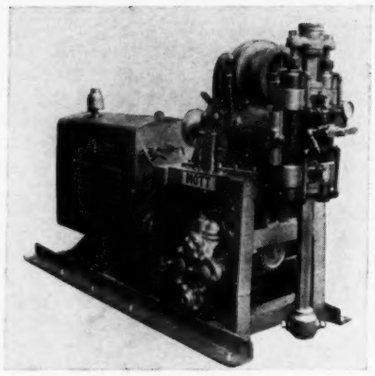
A reversible-model cushion-drive shaking conveyor, standard room chain-and-flight conveyors and a low-vein tandem-pulley 18-in. flat-belt conveyor with M-R-C "sealed-for-life" bearings for room service were displayed by the La-Del Conveyor & Mfg. Co., New Philadelphia, Ohio.

The Philips "Center-Guide" belt conveyor for underground service, said to be particularly adapted to thin seams and uneven bottoms, was offered by the Link-Belt Co., Chicago. Installa-

tions have been made in coal as low as 30 in., and the conveyor also is available for all other belt transportation, particularly where runs are long and guiding is a problem. The major feature of the conveyor is a belt with a continuous central guide strip on the underside which fits into grooves in the center roll of the special anti-friction conveyor idlers. Center-guide conveyors can be furnished with any width of belt and with double guides for wider belts. Link-Belt also offered the "Speed-O-Matic" control (*Coal Age*, January, 1937, p. 44) for stripping equipment. Stripping and loading shovels and draglines were presented pictorially by the Marion Steam Shovel Co., Marion, Ohio.

The Type A-40 gasoline-powered diamond core drill for mountain regions, taking standard 2¼-in. core, was demonstrated by the Mott Core Drilling Co., Huntington, W. Va. The drill, it is said, has a capacity of 1,000 ft. and weighs about one-fifth that of a corresponding steam drill. It moves about under its own power.

A No. 3 size Whaley "Automat" track-mounted coal loader with parallel-lift rear conveyor and permissible electrical equipment was shown by the Myers-Whaley Co., Knoxville, Tenn. Prox "Invincible" interlocked cutter chains were featured by the Frank Prox Co., Terre Haute, Ind., which also offered cutter bars with silico-manganese spring-steel guides and provided with setscrews for adjustments to take up losses in chain clearance. The company also stressed new "minimum-kerf" (not thin-kerf) equipment which requires no special cutter bar or chain yet leaves 1 in. more coal in the solid. Underground belt-conveyor



Mott A-40 diamond core drill

equipment was shown by the Robins Conveying Belt Co., New York. Truss-frame carriers for underground conveyors were displayed by the Stephens-Adamson Mfg. Co., Aurora, Ill.

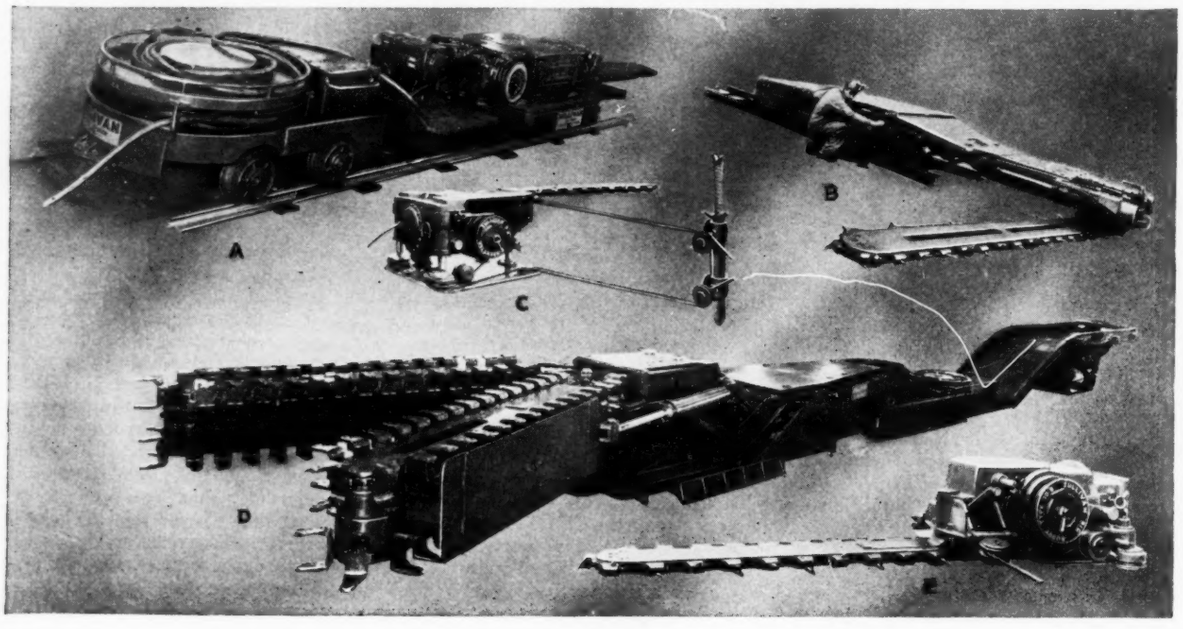
New loading and cutting equipment comprised the major part of the display of the Sullivan Machinery Co., Claremont, N. H. Included was the new Type SL-1 "Sawloader" designed to mine coal mechanically from the face and deliver it to the rear to a Sullivan "Transfer" skip or other transporting medium. Mining is done by two hydraulically advanced bars cutting and breaking out the coal in 30-in. benches. In starting operations in a place, the bars are pulled back and the machine is advanced by walking cylinders 42 in. at a time. Then, starting at the top, the bars are advanced scissors fashion into the coal until they meet in the center. In this process, the coal is broken down and pulled to a conveyor in the center which takes it to the rear of the machine. When the upper cut is completed, the cutter bars are dropped and the next cut is made. Height of the "Sawloader" is 30 in. and it is offered for coal from 3 to 5 ft. in thickness. An SL-2 unit also is available for longwall work.

The "Transfer" unit used with the loader consists of a "Transfer" skip working back and forth in a sectionalized steel trough, which is advanced with each cut made by the machine. The "Transfer" skip is actuated by the Type TPU-1 "Transfer Power Unit," consisting of a 15-hp. motor-driven drum, a hinged rear section, an adjustable elevating ramp, and a front unloading jib.

Another new Sullivan product was the Type 8-A 24-in. adjustable track cutter designed to place the advantages of track cutting in the hands of thin-seam operators. The machine is offered for coal over 30 in., and can be used as a bottom cutter or overcutter in seams not over 5 ft. thick. Two-point boom-and-bar articulation, it was stated, permits operation where timbers are close enough so that shortwalls formerly were required.

Sullivan also displayed the Type 9-B medium-duty overcutter for seams under 4½ ft. Short length, according to the company, makes this cutter especially suitable for conveyor mines or in other work where close timbering is required. With a 20-hp. motor and over-all heights varying from 23 to 46 in., the machine can be fitted with bars for cuts of 3 to 6½ ft. in depth and 2½-, 3½- and 4-in. kerfs. The 10-B "Big Buddy" medium-duty bottom cutter with 20-hp. motor was another new Sullivan product. Designed with relatively short dimensions, this cutter fills the gap between the "Little Buddy"

New Sullivan cutting and loading products: A, safety truck for shortwall cutters; B, Type 8-A 24-in. adjustable track cutter; C, Type 9-B medium-duty overcutter; D, Type SL-1 "Sawloader" and "Transfer" unit; E, Type 10-B "Big Buddy" cutter



and the standard shortwall, according to the company. Over-all height is 21 in.; over-all length, less bar, is 42 in. Cutter-bar length varies from 3 to 6½ ft. Kerfs are 2½, 3½ and 4 in.

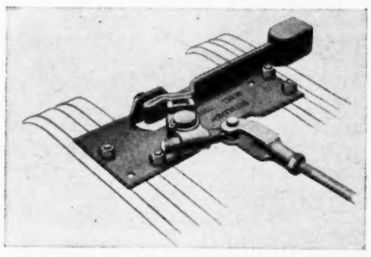
The Type T-5 two-speed safety power truck for shortwall machines, developed for United States Steel Corporation mines, was another new Sullivan product. The truck is featured by a separate trailer for the cable reel, made with a rounded rear end to reduce interference with posts, etc. Liberal riding space is provided, and all chains are covered with steel running boards. Other Sullivan products included: the Sullivan bit-sharpening and hard-facing plant, bit rollers, the 7-AU "Universal" track-mounted coal cutter with CD-14 independently driven mounted coal drill and water tank, 49 in. over the rail when tramming; CLE-5 longwall cutter, Types 6-B "Master" and 7-B "Super" shortwalls, Type 8-B "Dual-Duty" cutters, 5-B "Little Buddy" cutter and pneumatic drilling equipment.

Timken detachable bits for rock drills were featured by the Timken Roller Bearing Co., Canton, Ohio. Tracy cutter chains were shown by the Bertrand P. Tracy Co., Pittsburgh, Pa. The "Umeco" track-mounted loading machine was shown pictorially by Utility Mine Equipment Co., St. Louis, Mo.

Coal Movement Speeded Up

TRANSPORTATION exhibits at Cincinnati covered mine cars, locomotives, track, hoists and auxiliaries. Bronze and steel welded joints for mine track were featured by the Air Reduction Sales Co., New York, while the Austin-Western Road Machinery Co., Aurora, Ill., showed by pictures the use of Austin-Western trail cars for strip-mine transportation. A major item in the exhibit of the American Car & Foundry Co., New York, was the Leckie Collieries Co. solid-steel car for rotary-dump service. With four axles and spring draft and buffing gear, principal specifications are: inside length, 11 ft.; height, 26 in.; inside width, 6 ft. 4 in.; weight, 4,050 lb.; capacity, level full, 102 cu.ft.

Other A.C.F. features were links, pins and hitchings in both heat-treated and non-heat-treated types and chilled-tread



Bethlehem Model 1201 mine-track switch stand

wheels made under the improved A.C.F. heat-treating process stated to give a tread and flange with a Brinell of 500 to 600 deg., as well as a lower coefficient of friction between wheel and rail, thus reducing the load on the locomotive. Wheel types included double-plate, double-spoke, plain-spoke, plate-rib, angle-plate and combination plate-and-spoke types in both plain and anti-friction-bearing models. Adjustment of design and manufacturing procedure to eliminate soft spots on the tread or flange in all types, including plain-spoke wheels, was stressed by the company.

Bethlehem Steel Co., Bethlehem, Pa., called attention to the safety features of its new Model 1201 parallel-throw switch stand for light rails and displayed standard and special steel ties, switch stands, switch points, solid and riveted-plate frogs, rails; mine-track accessories, including rail fasteners, track bolts and spikes; and forged-steel mine-car, locomotive and mining-machine wheels. Height of the switch stand is 3 in. over the tie. The stand is declared to be self-cleaning, and all parts are above the tie where they are readily accessible and less susceptible to dirt. An adjustable screw-eye crank gives a throw-adjustment range of 2½ to 5 in. When in normal position, the weighted throw lever is on dead center and does not require latches. No bolts are used and there are only three moving parts. Disassembly is accomplished by removing one cotterpin. Included in the Bethlehem tie exhibit were special switch ties with welded plates to which the braces are bolted, making it unnecessary to cut the tie and thus eliminating the possibility of failure through corrosion starting at the bolt hole.

In addition to mine-car wheels, track sheaves and rollers, trip drags, rerailers and derailers, etc., Brown-Fayro Co., Johnstown, Pa., offered two new car-spotting hoists. Bearing the designation HKL, one of the new hoists was described as a heavy-duty slow-speed unit with a rope pull of 6,000 lb. at a speed of 25 f.p.m. All working parts are inclosed and the hoist is mounted on a sled-type base. The new HGD hoist, with sled-type base, has a rated rope pull of 2,000 lb. Load-rope speed varies from 0 to 175 f.p.m. Dimensions of the unit, fitted with a silent-chain drive, are: over-all height, 20½ in.; width, 30 in.; length, 48 in. When used as a room hoist, the unit is mounted on skids.

Starting with a pictorial display of mine cars, C. S. Card Iron Works, Denver, Colo., exhibited track equipment, track sheaves and rollers, and mine-car wheels. Included was the new MST manganese-steel-shell tapered-roller-bearing slope roller for heavy duty, large ropes and high speeds. Roller, shaft and bearings are said to be a self-contained unit which will not bind when set in the boxes and is easily disassembled when necessary. Both roller shells and ends are machined and balanced before assembly. The roller will run at least three months on one lubrication. Roller diameter is 6 in.; length, 14 in. Over-all length is 20¾ in., and the weight, depending upon the style of boxes, is 81 or 90 lb. The rollers are shipped grease-packed ready for installation.

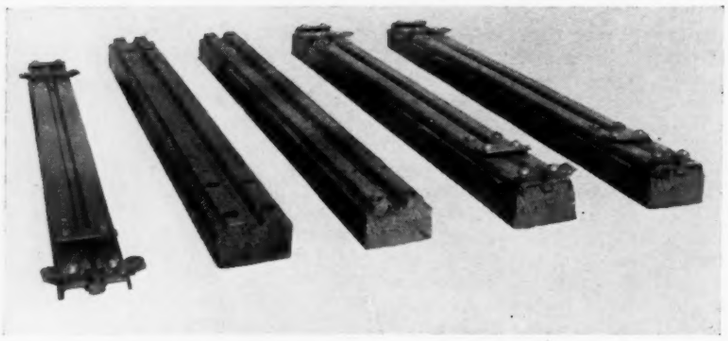
High-tensile light-weight steel mine cars and rails and steel mine ties were featured by the Carnegie-Illinois Steel Corporation, Pittsburgh, Pa., a subsidiary of the United States Steel Corporation, while another subsidiary, the Tennessee Coal, Iron & R.R. Co., offered rails and ties. Steel mine cars, locomotives, mine-car dumpers and strip-mining cars were exhibited pictorially by the Differential Steel Car Co., Findlay, Ohio. Cast-steel wheels for mine cars were stressed by the Duncan Foundry & Machine Works, Alton, Ill., which

Card MST slope roller

displayed wheels used three years by the Old Ben Coal Corporation and five years by the Chicago, Wilmington & Franklin Coal Co., to show resistance to wear. A late-type C. W. & F. 16-in. wheel with a weight of 102 lb., against 187 lb. in an earlier wheel, was another feature of the exhibit, which also included castings for mine cars. Low-type large-capacity all-steel mine cars with spring drawbars and rubber bumpers were shown by the Enterprise Wheel & Car Corporation, Bristol, Va.-Tenn.

General Electric Co., Schenectady, N. Y., exhibited the Southern Collieries, Inc., low-height sealed-equipped slow-speed cable-reel gathering locomotive. Specifications are: weight, 8 tons; over-all height, 28 in.; drawbar pull, 4,000 lb. at 4½ m.p.h.; width, 66 in.; length, 164 in.; wheel diameter, 25 in.; and wheelbase, 46 in.

Gibraltar Equipment & Mfg. Co., St. Louis, Mo., showed items from its line of "Gemco Tru-Blu" track tools, including: rail punches—P-4, 20- to 40-lb. rail, 22 lb.; P-7, 20 to 70-lb. rail, 26 lb., both in bar and ratchet styles; and rail benders—B-2, 12- to 25-lb. rail, 25 lb.; B-4, 20- to 40-lb. rail, 30 lb.; and B-8, 40- to 80-lb. rail, 53 lb. "Toncan" iron all-welded mine cars in lighter-weight higher-capacity types for both low and high coal were featured by the Irwin



Koppers "Armoored" room-entry tie

Foundry & Mine Car Co., Irwin, Pa.

Jeffrey Mfg. Co., Columbus, Ohio, displayed a 6-ton 4-m.p.h. low-vein inside-wheel gathering locomotive with extra-large triprider's compartment and anti-friction bearings throughout. Height is 27½ in. Materials and equipment for Thermit-welding rail joints were demonstrated by the Metal & Thermit Corporation, New York. The Miner spring bumper, providing both spring draft and buff for mine cars, and the Miner T-3 friction draft and buffing gear were demonstrated by W. H. Miner, Inc., Chicago.

Nachod & United States Signal Co., Louisville, Ky., displayed an electric switchthrower with various types of trolley contactors to permit operation from a moving locomotive, as well as manual controls and switch-position indicators. Also shown were "Reflex" trip markers, a new hydraulic spring-switch control to prevent the switch from closing between trucks while trips are trailing through, automatic trip-control signal systems, and a track contactor working by depression of the rail to operate a warning signal at crossings, etc.

"Naco" steel mine-car wheels, including an 8½-year-old wheel which had traveled about 45,000 miles, as well as hitchings, the Willison automatic coupler and a new friction draft gear for use with this coupler, were displayed by the National Malleable & Steel Castings Co., Cleveland, Ohio.

The new O-B automatic coupler for mine cars was demonstrated by the Ohio Brass Co., Mansfield, Ohio. Phillips Mine & Mill Supply Co., Pittsburgh, Pa., used photographs, models and actual units to present changes in mine-car design to increase capacity, car parts, heat-treated coupling pins and links; wheels of various types, car-dumping equipment, retarders and caging apparatus.

Sanford-Day Iron Works, Inc., used models and photographs to present its line of bottom- and end-dumping and solid mine cars, stripping cars and trailers, mine-car hitchings, the "S-D Floater" ball-bearing and other anti-friction wheels, and a full-sized rubber-tired underground trailer for battery-tractor haulage. Room and car-pulling hoists of various types were shown by the Sullivan Machinery Co., Claremont, N. H. "Umeco" light-weight aluminum alloy rail benders, punches, etc., were offered by the Utility Mine Equipment Co., St. Louis, Mo. A new low-height large-capacity four-axle car with ¾ in. drop on each axle to compensate for track irregularities was exhibited by the Watt Car & Wheel Co., Barnesville, Ohio. Other features are Watt-Dalton spring bumpers also providing spring draft, and dimensions as follows: height, 22 in.; inside width, 84½ in.; inside length, 144 in.; and over-all length, 166 in. Level-full capacity is 95 cu.ft. Weight is 4,000 lb. Weir-Kilby Corporation, Cincinnati, Ohio, offered Weir "Titan" frogs, switch stands, switches, guard-rail clamps, and other track materials.

West Virginia Rail Co., Huntington, W. Va., displayed a full line of rolled products for trackwork (frogs, switches, ties, etc.) and West Virginia switch ties fitted with braces to prevent rails from overturning.

Koppers "Armoored" ties for room-entry applications were featured by the Wood Preserving Corporation, Pittsburgh, Pa. These ties, consisting of a creosoted wood base to which a steel tie is bolted, are said to combine the labor-saving, installation, removal and gage-retaining advantages of the steel tie with the adaptability of the wood tie to surfacing and alignment. The beam strength of the wood portion also reinforces the steel tie and, it is stated, the ties support the rails where this type is used, rather than vice versa. Adaptability to surfacing and alignment is said to result in a track which stays in condition without attention for the life of the entry and also eliminates delays in serving equipment at the face.

Mining Aids Boost Efficiency

EXHIBITORS at the Cincinnati show offered a wide variety of staple and special products for coal-mine applications, including power-transmission equipment, bearings, explosives, lubricants, wood preservatives, jacks, repair parts, wire rope, steel and steel products, etc. Ahlberg Bearing Co., Chicago, featured "CJB Master" ball bearings, reconditioned ball bearings, and mounted bearings with new developments in shaft-locking methods and lubrication sealing designs said to make them desirable for fans, etc., where rigidity and dust are important factors. Welding gases, nozzles, tips and welding supplies were offered by the Air Reduction Sales Co., New York.

"Texrope" drives and sheaves, including the "Vari-Pitch" sheave for varying the speed of the driven machine, and "Ro-Twin" portable air compressors were displayed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., American Cable and Hazard Wire Rope divisions, American Chain & Cable Co., Wilkes-Barre, Pa., featured "Tru-Lay" preformed wire rope for mining applications. "Burcoal" and "Genite" permissible powders said to approach black-powder action were stressed by the American Cynamid & Chemical Corporation, New York.

In addition to "Coalite," "Apcol" and "Gel-Coalite" permissibles, "Blakstix" and pellet powder, granulated blasting powder, detonators, electric squibs and shotfiring units, Atlas Powder Co., Wilmington, Del., offered the new "Coalite" LS permissible, said to approach black powder in action and running about 215 1¼x8-in. sticks per 50-lb. case. "Yellow Strand" wire ropes, including "Flex-Set" preformed types for all mining services, were shown by the Broderick & Bascom Rope Co., St. Louis, Mo.

Brown-Fayro Co., Johnstown, Pa., demonstrated a new rubber-mounted journal box for absorbing shocks growing out of operation over uneven tracks, switches, etc. The box, it is stated, takes shock from all directions and can be mounted on either steel or wood-bottomed mine cars. Its new and used equipment services were featured by the Coal Mine Equipment Sales Co., Terre Haute, Ind. A full line of ratchet hoists was shown by the Coffing Hoist Co., Danville, Ill. The exhibit emphasized the new "Power-Master" hand-chain spur-gear gravity-lowering hoists in 1½- to 6-ton capacities; "Challenger" rope-pull spur-gear gravity-lowering hoists in ¾- to 2-ton capacities; and ¼- to 2-ton electric hoists.

Featuring special mining-machine, locomotive and mechanical-loader lubricants, Crescent Lubricating Co., Huntington, W. Va., offered a complete line of mining oils and greases. Duff-Norton Mfg. Co., Pittsburgh, Pa., displayed a new roof jack with universal joint on both ends and a special double-lock release arm designed to prevent accidental tripping and also permit remote collapsing. Other items were: new 5-ton mining jacks in various

heights with notch-for-notch or trip release lowering; new 5- and 15-ton general-purpose jacks with hinged base to permit tilting to raise loads; ball-bearing jacks up to 50 tons capacity; and timber and push-and-pull jacks.

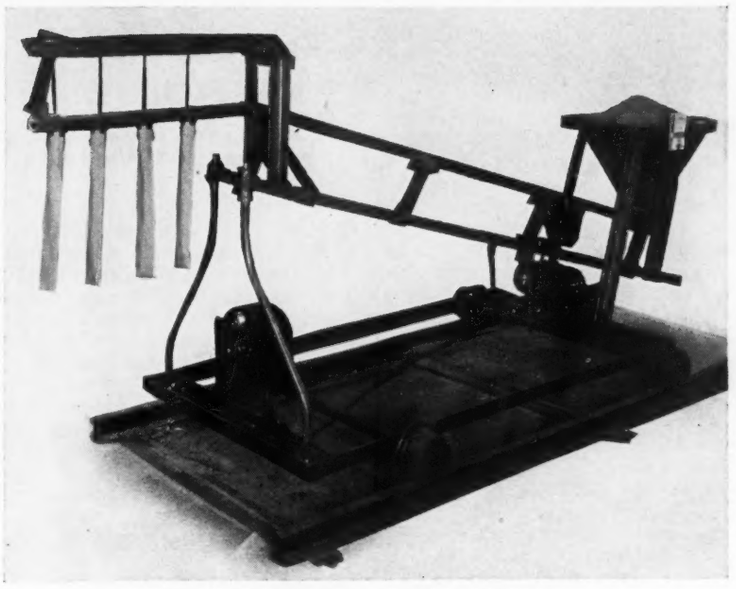
"Lump Coal C," a new permissible powder stated to have the slow, heaving action of either granular or pellet-type black blasting powders with Class A fumes, was featured by E. I. duPont de Nemours & Co., Inc., Wilmington, Del., in addition to electric squibs, delay electric igniters and squibs and electric and delay electric blasting caps. "Lump Coal C," according to the company, also has a spreading action which causes the coal to shear clean along the ribs and is available in a wide variety of cartridges. Chromated zinc chloride for wood preservation was featured by the Grasselli Chemicals Division of duPont.

In addition to bearings for mine-car wheels and other applications, Fafnir Bearing Co., New Britain, Conn., offered the new "4000 Series" with high-tensile bronze retainers in rigid and self-aligning types for severe mine services, and also featured the "Fafnir" cartridge for quickly converting plain-bearing to ball-bearing motors. For weighing in motion mine cars coupled in trips, Fairbanks, Morse & Co., Chicago, offered the "Printomatic" selector recorder making a printed record of weight and other details, in addition to the Fairbanks-Morse conveyor scale for weighing material in motion on conveyor belts.

A new 250-amp. mine-type resistance welder, the WD-33 300-amp. single-operator portable welding set and locomotive parts, including motor blowers, heatproof armatures, labyrinth frame heads and EW resistors, were displayed by the General Electric Co., Schenectady, N. Y. "G-M-C" 100- and 200-amp. portable arc welders supplemented "Gemco Tru-Blu" light-weight keyseaters shown by the Gibraltar Equipment & Mfg. Co., St. Louis, Mo.

Mining lubricants of all types, including mine-car greases, were offered by the Gulf Oil Corporation, Pittsburgh, Pa. Haynes "Stellite," "Hascrome," "Haystellite" and "Hastelloy" uses were featured by the Haynes Stellite Co., New York. The Heitzman safety rubber blasting plug eliminating the necessity for stemming in firing shots was offered by the Heitzman Safety Blasting Plug Corporation, Shamokin, Pa. "Hercoal F-1" permissible powder, stated to give all the advantages of a permissible and at the same time, when properly used, costs comparable with those obtained with black blasting powder, was featured by the Hercules Powder Co., Wilmington, Del.

Replacement parts for mining equipment were a feature of the display of the Jeffrey Mfg. Co., Columbus, Ohio. Joyce Cridland Co., Dayton, Ohio, offered a complete line of jacks for mining and heavy-duty industrial service, including: automatic-lowering 5-ton mining-machine jacks, mine timber jacks, standard- and high-speed ball-bearing jacks up to 50 tons capacity; and hydraulic jacks in capacities from 1½ to 30 tons. Manganese-steel parts for stripping and other mining equipment, including caterpillar treads, dipper teeth, pulverizer hammers, crusher parts, and rollers and sprockets, were featured by the Kensington Steel Co., Chicago.



Dummy-filling machine—Tamping Bag Co.

"Keystone" mining greases, including low-temperature types, and the Keystone Manifold Safety Lubricator for eccentrics, bearings, etc., were shown by the Keystone Lubricating Co., St. Louis, Mo. "Carbic" floodlights, Linde oxygen, "Prest-O-Lite" acetylene, and "Oxweld" and "Purox" cutting and welding torches were offered by the Linde Air Products Co., New York. Hercules "Red Strand" wire rope and cables, including hoisting, conveying, stripping, tramway-track and mining-machine types in both preformed and non-preformed construction, were shown by A. Leschen & Sons Rope Co., St. Louis, Mo. Link-Belt Co., Chicago, displayed the "P.I.V." variable-speed transmission, power chains and fittings, plain and anti-friction pillow blocks and the Link-Belt domestic stoker. Macwhyte internally lubricated hoisting, stripping, mining-machine, loader and scraper, and haulage ropes were offered by the Macwhyte Co., Kenosha, Wis., along with Atlas and Drew safety wire-rope slings.

New Departure Co., Bristol, Conn., offered a complete line of ball bearings, including mine-car and "N-D-Seal" conveyor-roll types. "Precision" bearings, including cartridge and "9000 Series" feltless types, were shown by the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

The "Osmose" wood-preserving process, based on the applying of "accepted" salt preservatives to green wood without mechanical pressure, was featured by the Osmose Corporation of America, Buffalo, N. Y. The preservative, according to the company, is applied by dipping or brushing and gives penetration comparable to that obtained with pressure treatments. Use of green wood obtained from near-by sources at low cost was stressed by the Osmose organization. No special plant or equipment is required.

Repair parts for mining machines and locomotives were shown by the Penn Machine Co., Johnstown, Pa. Phillips Mine & Mill Supply Co., Pittsburgh, Pa., called attention to its fabricated-plate and structural-steel services. A complete line of mining lubricants, including low-pour-point greases for plain and anti-friction mine-car bearings, was displayed by the Pure Oil Co., Pittsburgh, Pa. Roebling "Blue-Center" steel ropes for mining applications underground, on the surface and in strip mines, wire-rope fittings and flat cold-rolled strips were included in the exhibit of the John A. Roebling's Sons Co., Trenton, N. J.

SKF Industries, Inc., displayed ball, roller and spherical bearings and pillow blocks for mine services. Socony-Vacuum Oil Co., New York, featured "Gargoyle" lubricants and lubrication service. Standard Oil Co. of Indiana, Chicago, displayed a full line of lubricants and called attention to its engineering bulletin service. Replacement parts for coal cutters, Class WL-60 "Unitair" compressors and portable and stationary compressors were included in the exhibit of the Sullivan Machinery Co., Claremont, N. H. Sun Oil Co., Philadelphia, presented its industrial lubricants.

"Seal-Tite" tamping bags and a new vibrating-type dummy maker for filling and tamping blasting dummies were displayed by the Tamping Bag Co., Mt. Vernon, Ill. The machine consists of a hopper and vibrating conveyor with spouts to which the dummy bags are clipped for filling and tamping. Rock dust, sand or clay may be used, and the

machine is said to have a capacity of 500 to 600 1¼x18-in. dummies per hour. It is available in track, stationary and skid mountings.

"Simplex" jacks and maintenance units were shown by Templeton Kenly & Co., Chicago, which featured a new and powerful pinion, gear and wheel puller; light-type wire and trolley stretcher; collapsible roof jacks; double-acting automatic-reversing post-pulling jacks; a new line of high-powered geared-type lifting jacks in capacities up to 50 tons for heavy repair work; new mine-jack props built in swivel and stationary-head types and in various capacities and sizes; and a new 10-ton special jack for mine locomotives characterized by automatic raising or lowering with quick trip or release. "Tycol" oils and "Green-Cast" mining greases were presented by the Tidewater Associated Oil Co., New York.

Timken Roller Bearing Co., Canton, Ohio, pointed out applications of Timken tapered roller bearings to mine-car wheels, belt-conveyor rolls, slope rollers and sheaves and other mining equipment, and called attention to a new and improved stamped labyrinth inclosure for use on mine-car bearings to retain grease and exclude dirt. Tool-steel, hardened and heat-treated gears, pinions, sprockets and other mining-equipment parts were displayed by the Tool Steel Gear & Pinion Co., Cincinnati, Ohio. Repair parts for locomotives and mining machines were offered by the Bertrand P. Tracy Co., Pittsburgh, Pa. Tyson tapered cageless roller bearings for car wheels and other mining services were shown by the Tyson Roller Bearing Corporation, Massillon, Ohio.

United States Steel Corporation subsidiaries offered the following equipment and services: American Bridge Co., Pittsburgh, Pa., erection; American Steel & Wire Co., Chicago, "Tiger Brand" wire rope and fittings, nails, wire, etc.; Carnegie-Illinois Steel Corporation, Pittsburgh, high-tensile steel plate and shapes, "Multi-Grip" floor plates, sheets and tin-plate products, reinforcing bars, bearing piles, and steel shingles; Cyclone Fence Co., Waukegan, Ill., industrial fencing; Columbia Steel Co., San Francisco, Calif., Scully Steel Products Co., Pittsburgh, Pa., and the Tennessee Coal, Iron & R. R. Co., Birmingham, Ala., general line of Steel Corporation products; and the Universal Atlas Cement Co., Pittsburgh, "Universal" portland cement.

Universal Lubricating Co., Cleveland, Ohio, showed "Tulc" lubricants for mining service. Light-weight aluminum-alloy tools (jack pipes, rail benders, rail punches, etc.) were displayed by the Utility Mine Equipment Co., St. Louis, Mo. Western electric and delay caps, "Protect-O-Spool" blasting caps and other blasting materials and supplies were shown by the Western Cartridge Co., East Alton, Ill. Renewal parts and services and the "FlexArc" one-man welder were offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Purple-Strand" wire rope, mining cables, wire lines, and fittings and slings were exhibited by the Williamsport Wire Rope Co., Williamsport, Pa. Electric-arc welders were offered by the Wilson Welder & Metals Co., New York. Wood preservatives and methods were featured by the Wood Preserving Corporation, Pittsburgh, Pa.

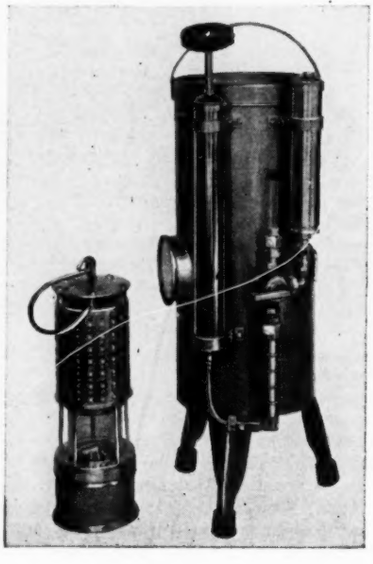
Equipment for Safer Mining

MANY manufacturers made safety, health and comfort their major themes at the Cincinnati exposition. The new "Tru-to-Life" safety dramalogue service for coal mines, based on the use of special models and posters accompanied by a moving message to attract attention, was offered by Advertising Displays, Inc., Covington, Ky. "Mine-Vent" flexible ventilating tubing and couplings and also American brattice cloth, including water-, fire- and fungous-proof grades, were featured by the American Brattice Cloth Co., Warsaw, Ind. "Brownie" auxiliary tubing blowers were shown by the Brown-Fayro Co., Johnstown, Pa.

"Ventube" for auxiliary ventilation service was displayed by E. I. duPont de Nemours & Co., Inc., Wilmington, Del. Tubing blowers and the "Aerodyne" fan were offered by the Jeffrey Mfg. Co., Columbus, Ohio. In addition to a full line of leather and rubber safety footgear, Lehigh Safety Shoe Co., Allentown, Pa., featured a new rubber footwear construction involving a change from a black- to a crepe-rubber sole with a larger percentage of pure gum giving twice the wear of the black sole and offering greater resistance to slipping. Lehigh also called attention to the new "Cross-Cord" cord-rubber soles for leather shoes for reducing slipping to a minimum and giving greater satisfaction than any previous Lehigh cord sole.

New products shown by the Mine Safety Appliances Co., Pittsburgh, Pa., included a redesigned air-velocity indicator of the direct-reading type operating from an Edison cap-lamp battery and fitted with a shoulder harness; a clean-air blower capable, depending upon size, of serving any desired number of air-line respirators with water-cleaned, humidified and purified air and making it unnecessary to risk the hazards of hooking onto compressed-air lines; and the Jarrett stretcher, designed so that it can be knocked down for storage in a small space, for handling the more serious injuries; and a dustproof first-aid kit. The latter is fitted with rubber gaskets and has the contents in separate packages to make access to them more convenient. The kit also features a locomotive mounting, and is designed to be brought out each night for check. Other M-S-A products included: continuous methane recorders, portable methane indicators, Edison electric cap and hand lamps and self-service charging racks, McCaa permissible oxygen breathing apparatus, gas masks of all kinds, "Comfo" respirators, "Comf-O-Caps," "Skullgards," safety shoes, goggles and other protective clothing and devices; safety harness for railroad car chasers and trimmers; first-aid material and equipment; Wolf safety lamps; H-H inhalators, M-S-A car stops, and other safety devices.

Portable Lamp & Equipment Co. testing cylinder for flame safety lamp

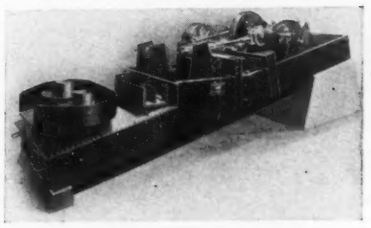


National Carbide Corporation, New York, featured carbide and carbide lights. The "U.C.C." methane detector was offered by the National Carbon Co., Cleveland, Ohio.

In addition to Wheat electric cap and hand lamps, the "cafeteria" charging rack, Koehler safety lamps, "Cool-Caps" and "Cool-Hats," rubber and leather safety footgear, heated first-aid cabinets and materials, goggles, combination splint and stretcher boards, respirators, car stops, derailers, skids and splicers; knee pads, and other safety equipment and materials, Portable Lamp & Equipment Co., Pittsburgh, Pa., featured a new safety lamp testing cylinder arranged for holding a lamp in an explosive gas-air mixture. Striking the lamp igniter produces an explosion in the lamp, and if it is improperly assembled the explosion carries outside the lamp into the explosion cylinder.

Supplementing a pictorial display of turbine and propeller fans, Robinson Ventilating Co., Zelienople, Pa., offered man coolers, tubing blowers and other ventilating equipment. Carbide was offered by the Union Carbide Co., New York. Utility Mine Equipment Co., St. Louis, Mo., offered a new and simple quick-attaching quick-detaching car stop for mine use.

Preparation Improvements



Dorr "Multizone" classifier

PREPARATION advances were epitomized at the Cincinnati exposition by full-scale equipment, models and pictorial displays, with supplementary exhibits covering refuse-disposal machinery. Abbe Engineering Co., New York, displayed Abbe-Herrmann sieves for washing, dewatering, filtering, classification and screening, including: wedge-wire sieves featuring assembly for accurate slot maintenance and, in the case of wedge wire for dewatering on vibrators, with brazed rivets and end bars for rigidity; the "Snake Screen" (*Coal Age*, September, 1936, p. 392); the "Harp Screen"; "Rastex" wedge-wire mesh; and a new-type high-capacity jig bottom.

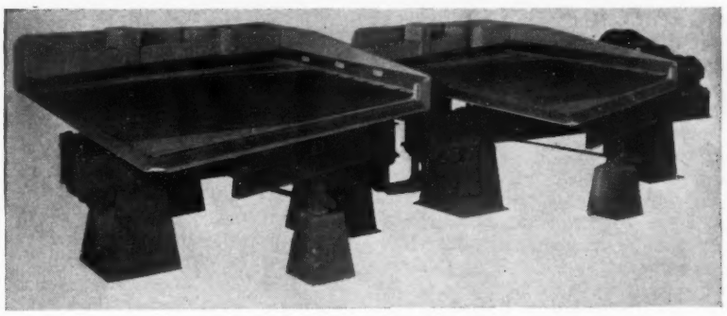
Allis-Chalmers Mfg. Co., Milwaukee, Wis., demonstrated a low-head vibrating screen for coal-mine service in addition to the Utah electro-magnetic feeder for handling coal and other material at a highly uniform rate with positive control of output. American Steel & Wire Co., Chicago, a subsidiary of the United States Steel Corporation, offered aerial tramways for coal and refuse transportation. Brown-Fayro Co., Johnstown, Pa., displayed Piggott high-pressure cold-oil-spraying equipment for dustless-treating coal. Dustless treatment with calcium chloride was featured by the Calcium Chloride Association, Detroit, Mich.

Chute-type tramp-iron and steel-removal magnets were displayed by the Central Electric Repair Co., Fairmont, W. Va. Carnegie-Illinois Steel Corporation, a subsidiary of the United States Steel Corporation, offered "Cor-Ten" and "18-8" stainless-steel screen plates. The "Waxolizing" process of rendering coal dustless was featured by the Coal Process Co., Kansas City, Mo. This process involves the hot application of a special treating fluid—"Waxol"—to the coal and, in addition to preventing dust, is said to reduce degradation, facilitate handling, control moisture evaporation, and improve burning.

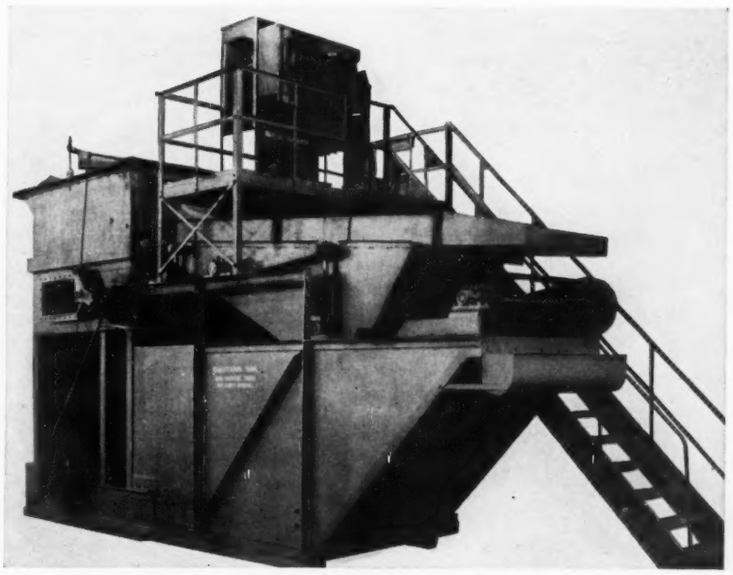
In addition to "Concenco" spray nozzles, "Concenco-Leahy" heavy-duty "No-Blind" vibrating screens for dedusting and general screening, Deister Concentrator Co., Ft. Wayne, Ind., displayed the new "Concenco Duplex" coal-washing table giving in effect two tables with the same driving unit. Features cited include: new self-oiling anti-friction-bearing head motion; high cleaning efficiency; greater operating economy; long life; 50 per cent or more capacity with the same floor space; independent adjustment of both cross and end tilt of both of the two decks; independent adjustment of the stroke of both decks; and ability to handle a different type of feed on each deck.

Three-way-dumping refuse-disposal larries were featured pictorially by the Differential Steel Car Co., Findlay, Ohio. In addition to the "Torq" traction thickener for the treatment of coal-laden wash water and other classifying and coal-preparation equipment, the Dorr Co., New York, offered the new Dorr "Multizone" classifier for improved classification at all separations up to and including 80-mesh. The new unit, the company states, utilizes turbulence, high pulp velocity and quiescent settling to obtain a cleaner product and a more readily controlled overflow. The lower, or overflow end, is decked over and is surmounted by one or more circular overflow columns of variable cross-sections. Feed material is introduced near the middle of the machine and passes downward and under a vertical baffle and then along the underside of the deck to the base of the overflow columns. Width of the unit ranges from 3 to 16 ft.

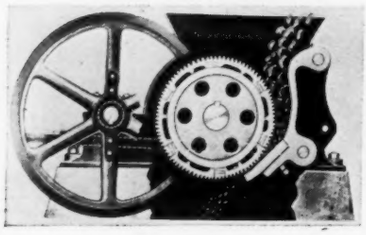
Reduction equipment of various types and particularly the Gruendler ring-hammer coal crusher were stressed pictorially by the Gruendler Crusher & Pulverizer Co., St. Louis, Mo. Spray oils for dustless treatment of coal were featured by the Gulf Oil Corporation, Pittsburgh, Pa. Hendrick Mfg. Co., Carbondale, Pa., showed round, square, oval end-stagger, hexagonal, and "Squa-round" screen plates; milled and diagonal-slot screens; Perisertread, short-slot and flanged lip screens; testing sieves; and other preparation products, in addition to "Mitco" interlocking grating, grilles, and other steel products. Banded ingredients in Illinois coal, and

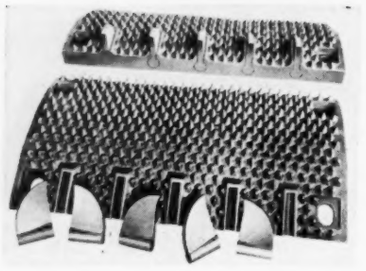


"Concenco Duplex" coal-washing table



Jeffrey self-contained washery





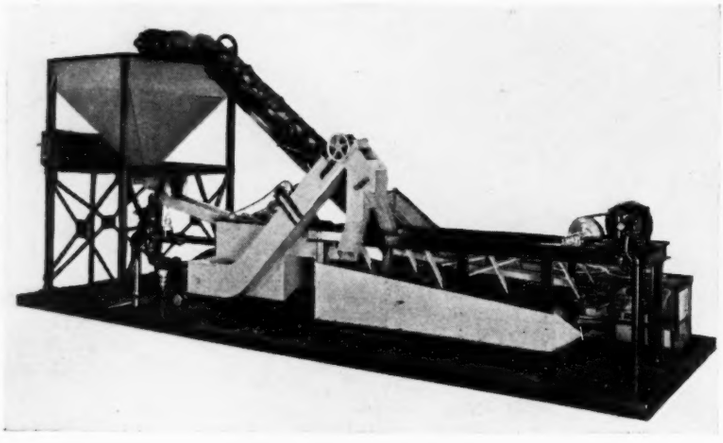
Jeffrey single-roll crusher for reducing degradation and oversize

coke made therefrom, were featured in the Illinois Geological Survey exhibit, which also included briquets made from Illinois coal without the use of a binder. These briquets, it was stated, have a smoke index one-fourth that of natural smokeless coal, less than 1 per cent of moisture; volatile matter, 28 per cent; fixed carbon, 60 per cent; ash, 10 per cent; and a B.t.u. content, as received, of 12,900.

A new self-contained washery for small tonnages was a feature of the exhibit of the Jeffrey Mfg. Co., Columbus, Ohio. With a capacity of 25 to 50 tons per hour, the new washery is an assembly of standard units, although the layout can be modified to suit requirements. It is stated by the company to be particularly suited to the washing of presized pea and nut coal and also slack from which the fines have been removed. The washery is made up of the following units: standard single-compartment Jeffrey diaphragm jig with fish-float control, positive ejector mechanism and refuse elevator; a single-deck steel-constructed dewatering screen with separate motor drive; a steel water-clarifying tank containing a standard sludge-recovery conveyor and standard Jeffrey-system skimmer flumes and pump sump for collecting and recirculating wash water; and a water-circulating system comprising a direct-connected centrifugal pump, piping and necessary control valves. Motors are controlled by pushbuttons at any convenient point. The settling tank, it is stated, is large enough to handle degradation from sized coal, and when it is desired to wash slack with the fine coal included a settling pond can be used in conjunction.

Among Jeffrey crushing units was a new single-roll crusher especially designed for the preparation of stoker and smaller coals with a minimum of degradation and oversize. This unit incorporates a new breaker plate designed to restrict the maw opening and minimize boiling of the feed. Also, the removable shoe is extended to carry the maw zone farther along the roll, permitting further sizing of the coal before discharge. Segments are made with rows of comparatively thin, sharp pyramid teeth alternated with rows of sharp spear-point teeth in a staggered arrangement, said to give a piercing rather than a mashing or wedging action and increasing size efficiency. As contrasted to the fittings above, for crushing nut coal, crushers for lump or egg are fitted with a breaker plate providing a less restricted maw opening, and segments are equipped with a new insert type of primary, or feeder, teeth, known as "Wejtite." "Wejtite" teeth and the grooves of the extended breaker-plate shoe are made narrower to minimize oversize yield. The segments also carry the special small-sized teeth noted above. Segments, breaker plates and extended shoes can be used for changing over earlier single-roll Jeffrey crushers. Also included in the Jeffrey preparation exhibit were Jeffrey-Traylor vibrating screens and feeders and the Jeffrey Baum-type automatic coal washer.

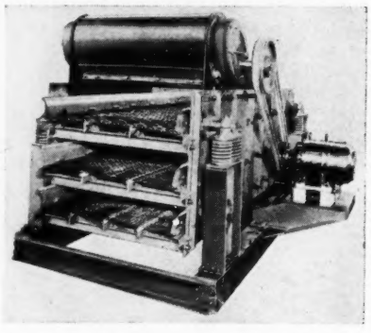
Model of Morrow washing and screening plant embodying the new Prins "Multi-Flow" coal washer



Diagrams and photographs were employed by the Koppers-Rheolaveur Co., Pittsburgh, Pa., to present its coal-preparation equipment and services, including Rheolaveur coarse- and fine-coal washers, Carpenter centrifugal dryers, Menzies cone saparators and Koppers-Llewellyn automatic coal washers.

Link-Belt Co., Chicago, featured the Link-Belt Simon-Carves coal washer with "electric-eye" reject control and other coal-preparation equipment, including vibrating screens and the Link-Belt "Roto-Louvre" heat dryer. "Black Diamond" single- and double-roll crushers with automatic tramp-iron protection were presented by the McLenahan & Stone Corporation, Hollidaysburg, Pa.

The McNally-Norton automatic coal washer, "Centriplex" pulverizers, McNally-Norton vertical pick breakers and other breaking, crushing and pulverizing equipment, coal tipples, and washing, screening and dewatering equipment were stressed by the McNally-Pittsburg Mfg. Corporation, Chicago.



Robins "Eliptex" vibrating screen

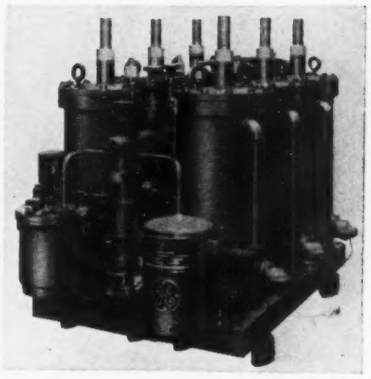
A washing and screening plant featuring the new Prins "Multi-Flow" fully automatic coal washer designed, according to the company, to eliminate complicated electrical controls, gate mechanisms, etc., was displayed in model form by the Morrow Mfg. Co., Wellston, Ohio. It is offered for cleaning any coal usually prepared mechanically and in any desired capacity. Symons horizontal vibrating screens were shown by the Nordberg Mfg. Co., Milwaukee, Wis. Slate larries, perforated plates, screen bars, chutes and weigh hoppers were featured by the Phillips Mine & Mill Supply Co., Pittsburgh, Pa. "Selectro" vibrating screens for coal sizing (*Coal Age*, March, 1937, p. 117) were displayed by the Productive Equipment Corporation, Chicago. In addition to a pictorial display of other preparation equipment and services, Roberts & Schaefer Co., Chicago, had on the floor a 4-ft. Stump "Air-Flow" coal cleaner of the type supplied the Pittsburgh Coal Co., 1 ft. wider than heretofore offered.

The Model 48-144 "Eliptex" horizontal vibrating screen, 4 ft. wide and 12 ft. long, with four decks for making five sizes of coal (top deck split) was shown by the Robins Conveying Belt Co., New York, N. Y., along with

Robins screen cloths and belt-conveyor equipment. Screen cloths for various services were presented by John A. Roebling's Sons Co., Trenton, N. J. Coal-spray oils were featured by the Standard Oil Co. of Indiana, Chicago.

Working models were used by the Stephens-Adamson Mfg. Co., Aurora, Ill., to present the air-sand coal-clean-process and Redler conveyor-elevators. "Coalkotes" for rendering coal dustless were featured by the Sun Oil Co., Philadelphia, Pa. W. S. Tyler Co., Cleveland, Ohio, displayed a Type 400 vibrator with Thermionic control, a Tyler-Niagara mechanically vibrated screen, test equipment, and screen cloths of various types.

Chance sand-flotation equipment for bituminous coal, including a small-capacity self-contained washer for small-capacity mines, was presented by the United Engineers & Constructors, Inc., Philadelphia, Pa. The self-contained washer, according to the company, operates at gravities as low as 1.35, employs 6- to 10-ft. cones, requires a maximum of 57 to 107 hp., will wash efficiently in one unit 4x⅜-in. coal, and is available in capacities of from 60 to 170 tons per hour. U. S. Bureau of Mines called attention to the experimental work at the Pittsburgh Experiment Station to explore the possibilities of manufacturing motor fuel by the hydrogenation of coal (*Coal Age*, October, 1936, p. 482). Viking equipment for dustproofing coal by the "hot-vapor" process was displayed by the Viking Mfg. Co., Jackson, Mich.



General Electric single-anode-type mercury-arc rectifier

Power Applications Extended

ELECTRICAL equipment and controls were a major feature of the 1937 equipment exposition at Cincinnati. Louis Allis Co., Milwaukee, Wis., displayed splashproof a.c. and d.c. motors with baffles to eliminate a direct path into the motor and to form water traps in the air passages, a shaft guard to prevent water from entering the bearing chamber through the shaft opening, and stator windings treated with a special composition coating to protect them against condensation or moisture-laden ventilating air. Other Louis Allis motors included: totally inclosed d.c. motors approved by the U. S. Bureau of Mines and the Underwriters' Laboratories; standard open motors and standard non-approved motors inclosed and protected against the entrance of dirt and water, and dustproof motors for use where airborne dust is encountered.

In addition to mercury-arc rectifiers and "Seal Clad" and ARZ totally inclosed motors, the Allis-Chalmers Mfg. Co., Milwaukee, offered "Ruptor-equipped" AP-7 across-the-line motor starters. The "Ruptors," according to the company, are inclosing chambers which confine and depotentiate the arc resulting from circuit interruption, increasing the interrupting capacity of the contacts and isolating contacts of opposite polarity. Ratings are: 7½ hp., 440 and 550 volts; 5 hp., 220 volts; and 3 hp., 110 volts.

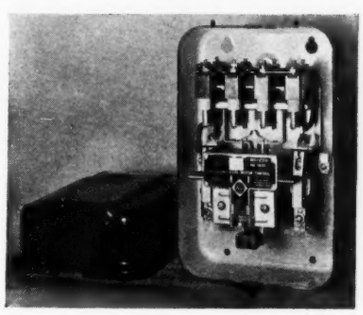
"Amerclad" all-rubber cables, electrical wires and cables, and "Tiger-Weld" rail bonds were offered by the American Steel & Wire Co., Chicago, a subsidiary of the United States Steel Corporation. Anaconda borehole suspensions, "Securityflex" trailing cables, bare transmission cable, weatherproof and slow-burning wire, "Securityflex" and "Duracord" locomotive and mining-machine cables, portable all-rubber cords, shotfiring cable, telephone and magnet wire; arc-welding, rubber-insulated parkway, armored "V.C.," "Duraseal" and "Durasheath" cables; trolley wires and cable accessories were shown by the Anaconda Wire & Cable Co., New York. Bowdil Co., Canton, Ohio, displayed the Bryant-Bowdil choke-arc transfer switch.

A stoker designed to burn coal from minus 48-mesh up to 2-in. was a feature of the display of the Duncan Foundry & Machine Works, Alton, Ill. The coal is carried into the furnace through an oscillating nozzle by an air stream fed by a drag-chain conveyor. Features cited by the manufacturer include: ability to fire any size of grate; adaptability to existing installations with hand-fired grates; extremely simple mechanism with only one reduction unit; ¾-hp. drive for both stoker and coal feeder; maintenance of a thin, level fuel bed with any size of coal without adjustments for size changes; extreme flexibility; and a wide range of capacity in one unit (one stoker is sufficient for 150- to 800-hp. boilers).

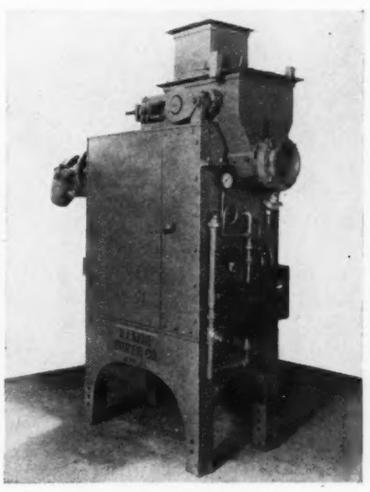
Edison nickel-iron-alkaline storage-battery cells for mine haulage were featured by Thomas A. Edison, Inc., West Orange, N. J. Electric Railway Equipment Co., Cincinnati, displayed equipment necessary for the complete installation of an approved trolley and feeder system, including quick-break iron-base line switches, trolley and feeder section insulators, splicing devices, anchor clamps and trolley frogs, all for use with 6/0 trolley wire and large feeders. Redesign for this larger wire was stressed. Other products included combination trolley and feeder supports, new devices utilizing double porcelain spools for carrying both telephone lines and light power circuits, and trolley hangers with a new insulation. "Erico" rail bonds and welders were offered by the Electric Railway Improvement Co., Cleveland, Ohio.

"Exide-Ironclad" cells for locomotive batteries and power tanks were displayed by the Electric Storage Battery Co., Philadelphia, Pa. Splashproof and ball-bearing motors were featured by Fairbanks, Morse & Co., Chicago. In addition to the "No-Fuse" permissible starter with De-Ion grid contacts, controllers, trolley wheels, gliders, splicers and other line materials, a field-coil testing machine and automatic and manual transfer switches, Flood City Brass & Electric Co., Johnstown, Pa.,

Allis-Chalmers "Ruptor-equipped" starter



Stoker for firing minus 48-mesh to 2-in. coal



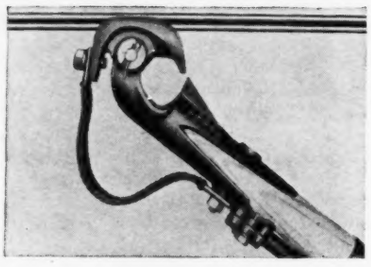
offered the new "Flood City" cable vulcanizer (No. 1600). Compactness (length, 15 in.; height, 9 in.; and width, 6 in.) and light weight (63 lb.) were stressed. Any source of power can be utilized provided heating units of the proper voltage are specified. Setscrews on the top provide the necessary pressure for a dense, hard joint.

A new single-anode-type multiple-tank mercury-arc rectifier for mine use was shown by the General Electric Co., Schenectady, N. Y. This rectifier, according to the company, embodies the principle of resistance starting and is designed with unusual strength and simplicity for efficient service over a long period of time. General Electric also called attention to its insulated cables with combination "Versatol" and tellurium insulations for greater insulating power and higher mechanical strength. Other exhibits were Pyranol insulation, carbon brushes, transfer switches, and motors and controls for mine services.

Gould Storage Battery Corporation, Depew, N. Y., showed "Kathanode Glassklad" cells for mine-locomotive batteries. "KSC" automatic-reclosing sectionalizing circuit breakers, "KSA" high-speed switchboard-style automatic-reclosing circuit breakers, "Itelite" thermal breakers for wiring and motor protection, "Urelite" steel-inclosed manual breakers for tipples, "KJB" magnetically operated breakers for special motor applications, and a new thermo-magnetic overload element for motor-starting protective services (any type of a.c. motor up to 1,000 hp., 550 volts) providing a choice of several time-current curves were offered by the I-T-E Circuit Breaker Co., Philadelphia, Pa.

M-S-A "Velocity-Power" completely self-contained, compact, portable lightweight cable splicers were offered by the Mine Safety Appliances Co., Pittsburgh, Pa. These splicers use the energy of an exploding blank cartridge to clamp a connector sleeve on the two ends of the wire. They are available in the No. 0 pistol type for splicing soft copper cable in sizes from 4/0 to No. 6, and in the No. 2 overhead type for use on overhead distribution systems and power lines. Weights are: No. 0, 8½ lb.; No. 2, 16½ lb.

In addition to trolley wheels, sectional switches, frogs and splicers, poles, pole heads, harps, clamps, expansion bolts, hangers, arc-welded bonds, etc., the Mosebach Electric & Supply Co., Pittsburgh, Pa., offered the new "Mesco" wobbler-type bronze slider, stated to have a greater contact area, to be lighter in weight and to have unusual flexibility in following the trolley wire. Pole head and harp are a single bronze casting, and alignment is taken care of by a swivel in the slider. Fewer parts are stressed by the manufacturer. Carbon brushes for mining services were presented by the National Carbon Co., Cleveland, Ohio. Electric coils and insulation were shown



"Mesco" wobbler-type bronze slider

by the National Electric Coil Co., Columbus, Ohio.

Ohio Brass Co., Mansfield, Ohio, displayed wheel- and shoe-type current collectors for mine locomotives; section insulators in automatic and non-automatic types; hangers, frogs, wire splicers, and other line materials; fused trolley taps; ground clamps; quick-break switches with adjustable clamps; insulators; bonds of all types; trolley-wire lubricators; safety feeder switches; gasproof fused junction boxes; Types KD, AD, DRT, KSD and KS6A motor starters for underground service; and a new gasproof headlight.

Ohio Brass also featured the new "KAD Special" automatic motor starter for underground service, consisting of all the units in the KAD type with the addition of a speed-regulating rheostat or an O-B cable junction, or both. The rheostat is said to permit proper adjustment of motor speed to obtain the desired frequency of stroke on shaker conveyors or the proper motor speed on other conveyors. The O-B cable junction is described as a triple-pole connector for trailing cables for installation both on the starter and on the motor. The circuit is established by placing the cable-junction cap on the body and rotating it. A wedging action and lock make a tight, accident-proof joint.

Storage-battery cells for mining service were shown by the battery division of the Philco Radio & Television Corporation, Philadelphia, Pa. The company's new steel-grid resistor was shown by the Post-Glover Electric Co., Cincinnati, Ohio, in addition to transfer switches, self-starters for d.c. motors and K. & H. solderless terminal plugs. Pure Carbon Co., St. Marys, Pa., displayed brushes and other carbon products. Insulated wires and cables were shown by the John A. Roebling's Sons Co., Trenton, N. J.

Simplex Wire & Cable Co., Chicago, presented Tirex mining cables, borehole cables, Anhydrex rubber compounds, rubber jacketed mine-telephone and signal-circuit cables, and special cables with "Latox" insulation. "Tong-Test" ammeters, Miller cable connectors and "Frigid-Arc" controllers were shown by the Sullivan Machinery Co., Claremont, N. H. "Dual-Duty" steel mechanical rail bonds were offered by the Bertrand P. Tracy Co., Pittsburgh, Pa.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., showed fan-cooled squirrel-cage motors for dusty and hazardous locations, fan-cooled explosion-tested d.c. motors, combination De-Ion breaker and linestarter units for a.c. motor starting, a new d.c. motor starter, Type HD heavy-duty push-buttons, and a complete line of trolley-wire and feeder supports, section insulators, sectionalizing switches, etc., including a new dead-end fitting and a new trolley-wire clamp.

Facilitating Drainage

EQUIPMENT and supplies for dewatering mines were offered by eight organizations at the Cincinnati exposition, while two others stressed sealing. "SSU" pumping units were displayed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. "Multiport" foot valves and strainers were featured by the Brown-Fayro Co., Johnstown, Pa. Pumping equipment shown by Fairbanks, Morse & Co., Chicago, comprised Figure 6155 "Simplex" mine gathering pumps, water- and oil-lubricated deep-well turbine pumps, including a new 6-in. unit for heads up to 100 ft. and capacities up to 50 g.p.m., with a 3-hp. maximum motor; a double-suction, ball-bearing split-case centrifugal pump; and an angle-flow-pump impeller for water containing coarse material and handled at heads of 10 to 30 ft. in capacities from 20 g.p.m. up. Flood City Brass & Electric Co., Johnstown, Pa., showed a reversible water end of high-grade acid-resisting bronze adaptable to various types and makes of plunger pumps.

Johns-Manville, Inc., New York, offered "Transite" corrosion- and electrolysis-resisting mine-drainage pipe with flexible "bottle-tight" joints. "Duroline" cement-lined pipe, scale-free pipe, copper-steel pipe and seamless-steel boiler tubes were featured by the National Tube Co., Pittsburgh, Pa., a subsidiary of the United States Steel Corporation. Peerless Pump Division, Food Machinery Corporation, Massillon, Ohio, showed heads and bowls for Peerless deep-well pumps and featured acid-resisting rubber-covered column and shaft tubes.

Sterling deep-well turbine pumps in capacities from 10 to 10,000 g.p.m. were offered by the Sterling Pump Corporation, South Bend, Ind. Effects of acid mine drainage and its prevention were pointed out by the U. S. Bureau of Mines. Sealing projects sponsored by the State Department of Health of Ohio and other States in cooperation with the U. S. Public Health Service were featured by the Works Progress Administration.

YOURS FOR THE ASKING

+ Complete Information on

Equipment, Materials and Supplies

Exhibited at Cincinnati Show, May 17-21, 1937

DO YOU WANT more information on equipment shown at the Cincinnati National Exposition of the American Mining Congress? A summary of the high spots of the show appear on pp. 270–80 of this issue, but for those who desire additional data, *Coal Age* has made special arrangements to see that you get it without cost or obligation. Simply mail one of the accompanying postcards with your name and address to *Coal Age*—no postage is necessary —and your request will receive prompt and careful attention.

Products exhibited at Cincinnati are listed below by companies sponsoring them. Each company has a number, and corresponding numbers appear on the postcards. To obtain the manufacturer's data, simply check on one of the postcards the company number and drop it in the mail. *Coal Age*, upon receipt, will take steps to see that you are promptly furnished with desired details. Once again, this service is free, in case you want information in addition to that on pp. 270–80 of this issue.

1 ABBE ENGINEERING CO.: Abbe-Herrmann screens for washing, dewatering, filtering, classification, screening, etc.

2 ADVERTISING DISPLAYS, INC.: Poster dramatization of mine safety campaigns; all types of advertising displays.

3 AHLBERG BEARING CO.: Single- and double-row self-aligning standard and heavy-duty bearings; all type bearings for mine use with shaft-locking and lubrication-sealing designs for ventilating fans, etc.

4 AIR REDUCTION SALES CO.: "Airco" oxygen, acetylene, "Airco D.B." welding and cutting apparatus and general oxyacetylene supplies for mine use; Airco electrodes, Stoody products for hard facing; data on hard-surfaced mining bits, "Turco" carbonic gas, "dry-ice."

5 LOUIS ALLIS CO.: Complete line of a.c. and d.c. electric motors for mining service; standard motors and motors with drip-proof head; splashproof motors; explosion-proof motors; gear-reducer motors.

6 ALLIS - CHALMERS MANUFACTURING CO.: "Rotwin" portable rotary mine-car compressor, "low-head" horizontal vibrating coal-sizing screen, electric mine motors, centrifugal pumps and Texrope V-belt drives, motor-control equipment, Utah electro magnetic feeder.

7 AMERICAN BRATTICE CLOTH CORPORATION: Six different grades of brattice cloth (jute ABC special, No. 1, No. 3 and double-warp duck Nos. 7, 27, 17) and four grades (Mine Vent Nos. 11, 12, 14 and 15) flexible ventilating tubing, demountable couplings.

8 AMERICAN BRIDGE CO.: (Exhibited by United States Steel Corporation).

9 AMERICAN CAR & FOUNDRY CO.: A complete steel mine car, and different types mine-car wheels.

10 AMERICAN STEEL & WIRE CO.: (Exhibited by United States Steel Corporation): Wire rope for all purposes; wire-rope fittings; track and tramway cable; Tiger weld rail bonds; electrical wires and cables of varying sizes; cut rail spikes and wire nails.

11 AMERICAN CYANAMID & CHEMICAL CORPORATION: Improved line of "Burcoil" and "Genite" permissible explosives with new developments in a series of explosives having a low rate of detonation and covering a wide range of cartridge strength.

12 ANACONDA WIRE & CABLE CO.: Bare wire, trolley wire; weatherproof wire; overhead transmission wire; locomotive and mining-machine cables; Duracord; Securityflex all-rubber cables, Seine-twine cable, high-low voltage trailer cables, non-metallic underground cable,

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COAL AGE

McGraw-Hill Publishing Co., Inc.

330 West 42d Street,

New York, N. Y.

telephone wire, shooting wire, cable accessories—potheads and suspension units.

13 Atlas Powder Co.: Complete line of Atlas explosives and blasting accessories, featuring selection and use of black powder and permissibles for specific mine usages.

14 Austin - Western Road Machinery Co.: Hydraulic scrapers, trail cars and various types of coal cars for rail haulage; motor graders, "Cletrack" tractors and bulldozers for haulage road preparation and maintenance in open-pit work; crushing machinery for waste materials.

15 Bethlehem Steel Co.: Various type steel ties for mine track; special steel ties for switches; switch points, frogs, switch stands, mine-track accessories, and hollow drill steel.

16 Bowdil Co.: Cutter chains, bars and sprockets, electric transfer motor switches, spike pullers, electric coal drills, secondary auger bits, coal picks with secondary points.

17 Broderick & Bascom Rope Co.: Preformed "flex-set" yellow strand wire rope for complete service to the mining industry.

18 Brown - Fayro Co.: Thin - seam "Brownie" car-spotting hoist for operation with conveyor systems; room and general-utility mine hoist, trip-drag for car handling, oil spray system for spraying coal to make it dustless; "Brownie" tubing blowers, mine-car wheels, rerailers, derailers, slope roller, strainers, foot valves, patented rubber mounted axle housing.

19 Bucyrus-Erie Co.: Photographs and data covering all types of shovels up to the 33-cu.yd. capacity dippers in open-pit operation; complete data on caterpillar-mounted and walking draglines and Bucyrus-Armstrong blast-hole drills.

20 Calcium Chloride Association: Presentation of calcium-chloride coal-treatment methods with photographs, models and operating data.

21 Card Iron Works Co.: Various type mine cars and rope-haulage equipment.

22 Carnegie-Illinois Steel Corporation: (Exhibited by United States Steel Corporation).

23 Central Electric Repair Co: Magnetic separator.

24 Chicago Pneumatic Tool Co.: Standard and permissible portable hand-held and mounted electric coal drills with safety switches and chucks; electric and pneumatic drills, nut-runners, grinders, chipping and riveting hammers, and pneumatic rock and auger drills for coal mining.

25 Cincinnati Mine Machinery Co.: New duplex bit machine, cutting chains and cutting bits.

26 Coal Mine Equipment Sales Co.: Used and rebuilt mine equipment of all kinds.

27 Coal Mining (A Publication).

28 Coal Process Co.: Data on the waxolizing treatment for coal.

29 Coffing Hoist Co.: Ratchet lever, hand chain spur-gear gravity lowering hoist, rope-pull spur-gear gravity.

30 Columbia Steel Co.: (Exhibited by United States Steel Corporation).

31 Crescent Lubricating Co.: Special greases for coal-mine lubrication.

32 Cyclone Fence Co.: Woven nonclimbable fence for property and equipment protection (exhibited by United States Steel Corporation).

33 Deister Concentrator Co.: "Leahy" heavy-duty vibrating screen, a new coal-washing table, and dedusters.

34 Differential Steel Car Co.: Mine cars, locomotives, and dump cars.

35 Dorr Co.: Working models of the Dorr torq. thickener for recovering water for re-use and dewatering coal sludge for draining, drying and future utilization; Dorr classifier for fine-size preparation; data and photographs of installations.

36 Duff-Norton Manufacturing Co.: Automatic lowering jacks for coal-mine use.

37 Duncan Foundry & Machine Works, Inc.: Automatic stoker to burn minus 48-mesh coal: gray iron and cast-steel mine-car wheels.

38 DuPont de Nemours & Co.: General line of explosives for mining. Grasselli Chemicals Department: Data on treated timbers and props, stop doors and ties of timber treated with chromated zinc chloride—decay resistant and fire retardant. Fabrics Division: Ventube for mine ventilation with photos of actual installations and samples of the product.

39 Thomas A. Edison: Data on utilization of storage-battery locomotives for gathering and main-line haulage; nickel alkaline storage batteries.

40 Electric Railway Equipment Co.: Devices for complete installation of trolley feeder systems, with trolley and feeder section insulators, trolley frogs, splicers, anchor clamps, supports; porcelain spools for telephone, light lines and power circuits from one suspension insulator.

41 Electric Railway Improvement Co.: Rail bonds and arc welding rheostats.

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42 Electric Storage Battery Co.: "Exide" and "Exide Ironclad" storage batteries for mine haulage.

43 Enterprise Wheel & Car Corporation: Low-type, large-capacity, four-axle-design mine cars.

44 Fafnir Bearing Co.: Complete line of ball and roller bearings, heavy-duty design, for mining operations.

45 Fairbanks, Morse & Co.: Printomatic mine-car and track scales, automatic weighers; conveyor scale that accurately records weight of continuous flow of coal; mine gathering centrifugal pumps; alternating- and direct-current ball-bearing mine motors for multiple usages, splash proof motors featured.

46 Flood City Brass & Electric Co.: Standard line of brass and bronze trolley wheels, harps, pole heads and trolley splicers; also a new cable vulcanizer for splicing all rubber-covered cables; reversible and adaptable water end for plunger pumps; permissible starter switch; field coil testing machine.

47 General Electric Co.: Electric motor brushes and cables, new mercury-arc single-anode multiple-tank rectifier, low-height sealed equipped mine locomotive, mine type resistance and arc welders, motors and controllers for mine applications, and locomotive replacement parts for modernizing and improving units which have been in service for a number of years.

48 Gibralter Equipment & Manufacturing Co.: Lightweight steel track tools, rail benders, punches, bonders, welders.

49 Goodman Manufacturing Co.: A new low-seam, 24-in. mounted bottom cutting machine; two new shortwalls (Types 412 and 512), low-vein and standard machines respectively; track-mounted loading machine (Type 260); Type L1B duckbill self-loading head with new size G 12½ universal drive with conveyor mechanism; Type 90S elevating conveyor of the straight type; standard 91C12 room conveyors; troughed-belt conveyors (Type 9726); mine locomotives.

50 Gould Storage Battery Corporation: "Kathanode" type storage battery with new type vent plug and patented terminal post seal, for locomotive commutation.

51 Grasseli Chemical Co. (Exhibited by DuPont de Nemours & Co.).

52 Gruendler Crusher & Pulverizer Co.: Crushers and pulverizers (single-roll, double-roll, ring-hammer, swing-hammer); sand crushers, vibrating and shaker screens; elevators and conveyors.

53 Gulf Oil Corporation: Exhibit and data on application of scientific lubrication of mining equipment. Outline of activity of Gulf Research Laboratories in developing new lubricants for coal-mine service.

54 Haynes Stellite Co.: Hard-facing welding rods, Stellite products and cutting tools (Haystelloy castings, corrosion-resisting).

55 Hazard Wire Rope Division of American Chain & Cable Co.: Tru-lay preformed wire rope.

56 Heitzman Safety Blasting Plug Corporation: Safety blasting plug, with data and illustrations.

57 Hendrick Manufacturing Co.: Screen plates with various sized and shaped openings; flanged lip, dewatering and testing screens, and perforated elevator buckets.

58 Hercules Powder Co.: Complete line of explosives and blasting supplies for coal mining.

59 Illinois (Mineral States Exhibit): Samples of coke, briquets, coal; charts of production and geology; analyses of coals; display of literature.

60 Irwin Foundry & Mine Car Co.: Cast-iron locomotive brake shoes, electric welded mine-car bumpers, mine-car wheels, shaker-screen plates (flat and stepped type).

61 I. T. E. Circuit Breaker Co.: "KSC" automatic reclosing circuit breaker, Type "KSA" high-speed switchboard-mounted circuit breakers, cut away and complete models of "Italite" thermal breakers and a panel carrying both "Urelite" steel-inclosed and "KJB" magnetically operated breakers for special motor applications.

62 Jeffrey Manufacturing Co.: L 400 heavy-duty and 44L loading machines; new 29U Universal cutting machine; Aerodyne ventilating fan and auxiliary blowers, various type conveyors and the 52B entry belt; hand- and post-mounted drills; modernizing replacement parts for Jeffrey machines; single-roll and flextooth crusher; self-contained diaphram jig washery; motion pictures showing Jeffrey equipment under operating conditions; electric vibrating and conveying screen; "Waytrol" constant-weight feeder; 6-ton gathering locomotive; 61-HG face conveyor, 61-AM room conveyor, 52B entry belt conveyor, 24-L combination longwall and shortwall cutter, 20-h.p. 35C conveyor shortwall cutter, 35-L shortwall cutter, 35-B B shortwall cutter.

63 Johns-Manville Co.: Transite pressure pipe for mine waters, Simplex coupling for transite pipe.

64 Joy Manufacturing Co.: Portable and assembled chain conveyors complete; Joy Junior low-seam loading

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machine, 26 in. over-all height; Type 8 BU loader for medium-height seams; Type 7 BU loader, 40 in. over-all height, and heavy-duty Type 11 BU Joy loader with guaranteed capacity of 4 tons per minute; caterpillar truck.

65 JOYCE CRIDLAND CO.: Complete line of mechanical and hydraulic lowering mine jacks for cutting machines (1 to 100 tons capacity).

66 KEYSTONE LUBRICATING CO.: Latest developments in lubricants for high-temperature and water-resistant greases as well as standard grades for mining equipment.

67 KOPPERS CO.: Display and data on wood preserving and the Koppers Rheolaveur washery with information on Koppers Testing Laboratories.

68 LA-DEL CONVEYOR & MANUFACTURING CO.: Reversible-motion, cushion-driver shaker conveyor; sealed-bearing conveyor belt rollers and idlers; room chain flight conveyors equipped with anti-friction bearings throughout; portable blowers.

69 LEHIGH SAFETY SHOE CO.: Improved steel-box-toe, all-leather safety shoes; also rubber boots and shoes; special new mine shoe with rubber tip reinforcement across steel toe cap and rubber counter support to prolong life at these two important points of wear.

70 LESCHEN & SONS ROPE CO.: Data on standard and preformed wire rope in both flattened strand and round strand for all mining applications.

71 LINDE AIR PRODUCTS CO.: Linde oxygen, Prest-O-Lite acetylene, Union Carbide miner's lamp carbide, Carbic flood lights, Carbic medium-pressure acetylene generator, Oxweld welding rods, Oxweld oxyacetylene equipment (welding and cutting torches, oxygen and acetylene regulators, Purox torches and regulators, Prest-O-Weld torches and regulators); U.C.C. gas indicator, Pres-O-Lite 5-in-1 torch (brazing, soldering and lead-burning).

72 LINK BELT CO.: Exhibition of new equipment for drying by the Roto-Louvre method; center-guide belt conveyor for underground haulage; Speed-O-Matic shovel dragline; miniature model of the Simon-Carves preparation plant; motorized helical-gear speed reducer; underground belt conveyors; PIV gear variable speed transmission unit with remote control; vibrating screens; elevating and conveying power-transmission accessories; domestic type stoker.

73 MCGRAW-HILL PUBLISHING CO., INC.: Mining publications, *Coal Age* and allied technical journals, with books of interest to the mining industry.

74 MCLANAHAN & STONE CORPORATION: Black Diamond 18x24-in. steel-strut, quick-adjustment V-belt drives; single-segment roller crusher.

75 MCNALLY-PITTSBURG MANUFACTURING CO.: Data on coal-preparation plants and designs manufactured; tipples, washeries, breaking and screening plants which include following products: mine-car feeders, rotary dumps, retarding conveyors, weigh hoppers, shaker screens, picking tables, loading booms, vertical pick breakers, single-roll crushers, double-roll crushers, Norton automatic washers, railroad car retarders, elevators, conveyors.

76 MACWHYTE CO.: Specially designed wire rope for hoists, mining machines, mechanical loaders, shovels and draglines; also special braided wire-rope slings.

77 MARION STEAM SHOVEL CO.: Photographs and data pertaining to coal stripping and loading shovels.

78 MANCHA STORAGE BATTERY LOCOMOTIVE CO.: Pictures and complete data on mine storage-battery locomotives.

79 METAL & THERMIT CORPORATION: New type equipment for Thermit welding of mine rails, sample welds and complete information on application of the process to mining activities.

80 MINE SAFETY APPLIANCES CO.: Edison cap lamps, new lightweight methane detector, low-velocity electrical anemometer, air blower and airline respirators, knee pads, safety and safety toe shoes, pacs and a complete line of mine-rescue equipment; Skullgard protective hats, Temple cable splicer, "Comfo" respirators.

81 MINES EQUIPMENT CO.: Cable connectors.

82 MORROW MANUFACTURING CO.: Data on coal tipples and preparation plants with a model of a "Prins multi-flow coal washer."

83 MOSEBACH ELECTRIC & SUPPLY CO.: New combination joint and cross bond, positive and negative feeders, reversible sectional insulator switches, Mesco wobbler type trolley slider, Mesco Locktight splicer, Mesco arc-welding machine, hand-operated electric traffic light.

84 MOTT MACHINE & MANUFACTURING CO.: Data on diamond core drill, capacity 1000 ft., for large-size core for coal prospecting.

85 MYERS-WHALEY CO.: Whaley Automat loading machine with photographs and operating data of various installations; also working model of the Myers-Whaley rock-loading machine.

86 NACHOD & UNITED STATES SIGNAL CO.: Track switch (electric operated from locomotive, also manual control), position indicators, spring switch control; model and data on 4-entry block of automatic signals; reflectors; contactor, butterfly; contactor, 5-M; contactor, Rail No. R32; reflex trip marker; signal cases, automatic signals.

87 NATIONAL CARBIDE CORPORATION: Carbide and Carbide lights and lanterns.

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88 National Carbon Co.: Carbon brushes, "Pyramid" carbon and graphite products, welding carbon electrodes.

89 National Electric Coil Co.: Data on electric coil service.

90 National Malleable & Steel Castings Co.: Mine-car hitchings, couplings and wheels; Wilson mine-car coupler with friction draft gear.

91 National Tube Co.: (Exhibited by United States Steel Corporation).

92 New Departure Co.: Various type bearings for mining equipment; conveyor roller and mine-car wheel bearings; special sheave mountings, new conveyor mountings and a ball demonstrating machine.

93 Nordberg Manufacturing Co.: Symons double-deck horizontal vibrating screens for coal preparation; complete data on mine hoists; track shifters for open pits.

94 Norma-Hoffmann Bearings Corporation: Various types of ball, roller and thrust bearings for mine use; pillow blocks and mountings and a new type self-inclosed ball bearing with removable seals and grease refilling plugs.

95 Ohio Brass Co.: Complete line of trolley and rail bonding equipment, and motor starters.

96 Osmose Corporation of America: Data on "salt" treatment process for wood preservation without mechanical pressure; samples of "Osmosized" wood showing penetration.

97 Peerless Pump Division, Food Machinery Corporation: Turbine and deep-well pumps.

98 Penn Machine Co.: "Everlast" superweld rail bonds; replacement parts for various types of mining equipment.

99 Philco Radio & Television Corporation: "Philco Flote" steel-glass batteries for coal-mine use.

100 Phillips Mine & Mill Supply Co.: Mine cars, gravity rotary and cross-over dumps, screen plates and bars.

101 Portable Lamp & Equipment Co.: Personal protective equipment for mines, consisting of Wheat electric cap lamps and Koehler flame safety lamps, "Cool" safety caps and hats, leather and rubber safety boots and leather shoes, respirators, goggles, knee pads, first-aid cabinets and stretcher boards; also mine-track car stops, skids, derailers and splicers and a line of safety belts for car droppers, shaft sinkers, pole climbers, and electricians.

102 Post Glover Electric Co.: P. G. resistors for coal-mine locomotives and machines, P.G. d.c. motor starters for mine pumps and fans, P.G. transfer switches for use on gathering locomotives, H.&H. solderless terminals. "Promet" bronze heat-treated bearings and bushings.

103 Productive Equipment Corporation: Positive eccentric vibrating screens with controlled throw to vary extent of vibrating to suit material handled.

104 Frank Prox Co.: Cutter chains and cutter bars.

105 Pure Carbon Co., Inc.: Complete display of various types and sizes of carbon brushes for mining equipment.

106 Pure Oil Co.: Complete line of lubricants for the mining industry.

107 Roberts & Schaefer Co.: Stump Air-flow coal cleaner with data and photographs covering this equipment and the improved Hydroseparator and "Wuensch" coal-cleaning process.

108 Robins Conveying Belt Co.: Complete sectional mine conveyor equipment and Robins Eliptex screen; complete display of troughing, return and training idlers; super gyratory screen cloth; "non-blind"-type screen cloth.

109 Robinson Ventilating Co.: Tubing blowers, turbine-type pressure blowers, propeller-type ventilating fan, model forced-draft fan, complete line of mine and industrial fans.

110 John A. Roebling's Sons Co.: Woven-wire fabrics, insulated wire and cables with a complete line of wire rope for mining activities.

111 Sanford-Day Iron Works, Inc.: Data on automatic bottom-dump mine cars, wheels, etc.

112 Scully Steel Products Co.: (Exhibited by United States Steel Corporation).

113 Simplex Wire & Cable Co.: Permanently waterproofed, specially processed, insulated mining cable.

114 S. K. F. Industries, Inc.: Pillow blocks for the mining industry with a complete assortment of ball and roller bearings for all types of equipment.

115 Socony-Vacuum Oil Co.: Lubricants for mining equipment.

116 Standard Oil Co.: Complete data on lubricants for mining equipment with charts illustrating applications of various types of lubricants.

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117 St. Louis Power Shovel Co.: Pictures and complete data on the Conway shovel—a fast-working, low-cost mucking machine.

118 Stephens-Adamson Co.: Sectionalized underground belt conveyors with tubular frames formed by standard knock-down parts, Redler elevators for handling dust and small sizes of coal; air-sand process for dry-cleaning coal; "S-A" box-car loader; "S-A" motor winches; "S-A" car pullers; heavy-duty and normal-duty vibrating screens; "S-A" pillow block.

119 Sterling Pump Corporation: Deep-well turbine-type pumps; complete data and photographs on pumps and pumping problems.

120 Sullivan Machinery Co.: Presenting a new method of coal transportation; three new-type coal cutting machines (Types 8A, 9B and 10B); room hoist, car puller, Unitair compressor, rock drills (CLU 5B, 6B, 7B and 8B), bit sharpener, hard-facing plant, and all parts and supplies.

121 Sun Oil Co.: Data and photographs on the "Coalkote" method of dustproofing coal, coke and briquets and special greases and lubricants for coal-mining equipment.

122 Templeton Kenly & Co.: tamping bag filling machines, tamping bags and a water-hardening-type chisel steel; also a safety trip maker.

123 Templeton Kenly & Co.: New design mine jacks and complete assortment for all mining uses.

124 Tennessee Coal, Iron & Railroad Co.: (Exhibited by United States Steel Corporation).

125 Tide Water Associated Oil Co.: Lubricants and greases for all types of mining equipment.

126 Timken Roller Bearing Co.: Tapered mine-car bearings, tapered bearings for conveyor idler rollers and for rope rollers and rock bits.

127 Tool Steel Gear Pinion Co.: Replacement parts for mining machinery.

128 Bertrand F. Tracey Co.: Gears and pinions, cutter chain, replacement parts for locomotives and mining machines and mechanical rail bonds.

129 W. S. Tyler Co.: Tyler Niagara screens (for coarse sizes), Type 400 screen (for fine-mesh separation) and 16-1 sample reducer.

130 Tyson Roller Bearing Co.: Cageless tapered roller bearings for car wheels and other mine applications.

131 United Engineers & Constructors, Inc.: Chance coal-cleaning system data and photographs showing actual installations.

132 United States Bureau of Mines: Data on mine sealing to prevent acid drainage.

133 United States Steel Corporation: Steel products of American Bridge Co., American Steel & Wire Co., Carnegie-Illinois Steel Corporation, Columbia Steel Co., Cyclone Fence Co., National Tube Co., Scully Steel Products Co., Tennessee Coal, Iron & Railroad Co., Universal Atlas Cement Co.: Wire rope and fittings, aerial tramway equipment, nails and spikes, mine ties, Lorain roof jacks, "Tiger" rail bonds, tubular products, high-tensile steels, sheet products (roofing sheets and shingles), Cyclone fence.

134 Universal Atlas Cement Co.: (Exhibited by United States Steel Corporation).

135 Universal Lubricating Co.: Complete line of lubricants for mine cars and mining equipment.

136 Utility Mine Equipment Co.: Car stops, sounding and roofing bars, jack pipes, spike bars.

137 Viking Manufacturing Co.: Viking hot-vapor coal-treatment process; photographs and complete data on installations.

138 Watt Car & Wheel Co.: An all-steel car with Watt-Dalton spring bumpers; capacity, 95 cu.ft.; weight, 4,000 lb.

139 Weir Kilby Corporation: Frogs, switches, guard rails, etc.

140 Western Cartridge Co.: Blasting caps.

141 West Virginia Rail Co.: Rails, ties, frogs, switches and complete heavy-duty track material for coal mining.

142 Westinghouse Electric & Manufacturing Co.: A new motor-driven Flexarc welder; complete line of material for supporting trolley wires and feeders; sectionalizing switches, insulators, replacement parts for old motors and controllers, fan-cooled squirrel-cage motors for use in dirty or hazardous locations, direct-current explosion-tested motors, a.c. and d.c. starters, heavy-duty pushbuttons, Stroboscope for studying performance of machinery and equipment under load; a.c. and d.c. industrial analyzers; insulating materials.

143 Williamsport Wire Rope Co.: Display and data of all types and sizes of mining machines and shovel cable.

144 Wilson Welder & Metals Co. Inc.: Data on Wilson electric arc-welding machines, specimens of electrically welded rails, welding helmets and hand shields.

145 Wood Preserving Corporation: (Exhibited by Koppers Co.)

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NOTES

From Across the Sea

TWO separate machines generally have been used whenever cutting and loading have been made separate operations—that is, a cutting machine has been provided to prepare the coal for dislodgment, the coal has been shot down and then another machine has lifted it from the floor, transported it a few feet and deposited it in mine cars or onto a conveyor. Hitherto, question does not seem to have been raised whether a similar cycle of operations could be provided with a single machine doing the work of both, though machines have been made that cut and load coal simultaneously.

The operating parts in the suggested machine would be different for the two operations, but only one power mechanism for transporting and working the machine would be necessary, and the machine could cut while traveling in one direction and load when traveling in the other, thus making it work while flitting. Combination of both cutting and loading in one unit prevents interference between units and should reduce the first cost of equipment considerably, for the power end of the machine is the expensive item.

New equipment, with this duplicate function in mind and described by the *Iron and Coal Trades Review*, is being used at the Houghton Main mine, of the Houghton Main Colliery, Ltd., Barnsley, Yorkshire, England. This machine, known as the Meco-Moore cutter-loader, works on a longwall face. In cutting, a 5-ft. 6-in. cutter bar, or "jib," undercuts the coal much as do longwall undercutting machines in this country. The loading mechanism, being at the forward end of the machine and beyond the cutter bar, that bar can approach only within 7 ft. 6 in. of the end of the longwall face, but, as the dipping part of this sloping face is 300 ft. in length and the rising part is 360 ft. long, these corners at the remote ends of both faces can be removed by hand picks without appreciably raising the entire operation expenditure.

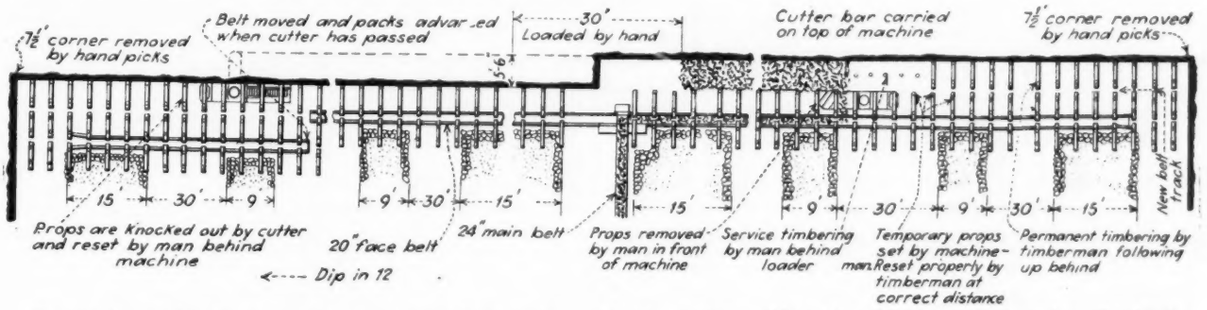
When the cut has been made, the loading mechanism is swung round so that its flat end with its belt enters the end of the cut, ready for loading as soon as the coal is shot. The coal is eased down by explosives which in this case when placed appear to give best results at 7-ft. centers. This swinging places the small loading boom out toward the belt onto which the coal is to be loaded.

The machine then starts to traverse the face, loading as it travels toward the mother gate, thus advancing in the opposite direction to that which it traveled when cutting. The loading boom with its level belt is arranged so that it can be swiveled in either direction and thus the loader can be worked on either the left or right longwall face.

Coal being mined at Houghton Main mine is 4 ft. 3 in. thick and has a dip of 1 in 12. It will be noted from the plan how carefully the roof, which is of average strength, is supported to the face with cross timbers and posts. The timbers are set so as to protect the machine, though the post near the coal has to be knocked out where the machine is cutting and entirely removed where it is loading. In the latter case posts temporarily are placed behind in the space left by the coal as it is being loaded, but, as the machine goes forward, these posts are replaced by permanent cross timbers and props.

The conveyor is located in an alley between two sets of cross timbers, the adjacent posts of the two sets of timbers being so close, however, that the conveyor is well protected. One end of the longwall usually is cut while the other is being loaded. As the conveyor in the main, or mother, gate rests on the top of the bottom rock, or "pavement," and no bottom is lifted, the coal near the mother gate for a distance of about 30 ft. has to be shoveled by hand onto the belt, which here is raised above the floor for delivery of the coal into cars.

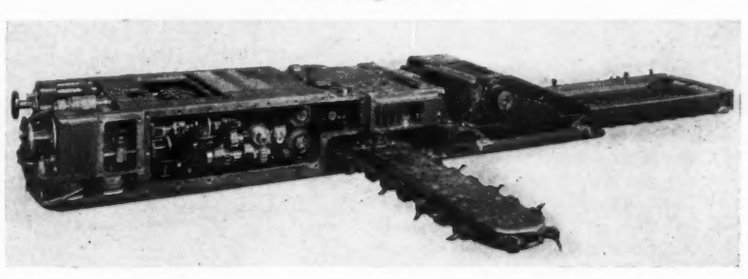
Three men are employed on the cutting and four on the loading shift, one of whom is the man who removes and places the pans, for bridging pans or plates are used to cover the distance between machine and conveyor and permit the coal to be loaded without disturbing any of the props alongside the conveyors. The machines weigh



Face being stripped of coal by two combined cutter-and-loader units at Houghton Main mine, Barnsley, England

5 tons, are 14 ft. long when loading, 17½ in. high and 37 in. wide. When cutting with the loading equipment in line with the machine, this width is nowhere exceeded. A "gumming" or undercutting worm, adjacent to the cutter chain sprocket, pulls out the cuttings there deposited by the chain, placing them where they will be clear of the machine and can easily be handled. The coal is carried by the loading mechanism on a slatted belt, and a "comb" arrangement lifts the

Machine traveling under its own power cuts and then loads the coal from a longwall face



coal from the floor, placing the former on the belt, so that only the finest of dust is left in the place. At Houghton Main mine each cutter-loader is producing 230 tons daily.

When the coal seam has good cleats and is not too massive and where the roof readily can be controlled, the coal may be simultaneously cut, brought down and loaded. To this end, a shearing cutter bar and one for overcutting are mounted on the end of the loader so that three cuts may be made and the coal loosened by the action of the loading equipment.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Orders for all books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Explosion at Gresford Colliery, Denbighshire, by Sir Henry Walker, John Brass and Joseph Jones. Mines Department (British). Cmd. 5358. British Library of Information, New York. 170 pp., 6x9¾ in., with six folded charts; paper. Price, $1.10.

The lengthy report (dated Dec. 13, 1936, and recently released) of an explosion in a North Wales coal mine, Sept. 22, 1934—the worst experienced in Britain since that at Senghenydd colliery in 1913—has not satisfied some of the labor members of Parliament who have been calling for a printing of the testimony at full length. The total loss of life was 265 men, and at the time of issuance the sealed mine had not been reopened for inspection. Three men lost their lives in recovery before sealing.

An explosion occurred in the Dennis section of the mine and all but six of the men in that section were killed. Three men in a rescue brigade lost their lives. A fire followed the explosion.

Charges are made of laxity and understaffing, of too low escapeways, lack of rock dust and ventilation and too many shots per shotfirer. Apparently 3.3 lb. of rock dust per ton of coal mined was used. This, the chief inspector says, would suffice to raise the incombustible matter in the coal dust well over 50 per cent if properly distributed. Opened in 1910 and according to the best standards, it was a good mine, but apparently became difficult to ventilate by reason of excessive faulting and many long airways.

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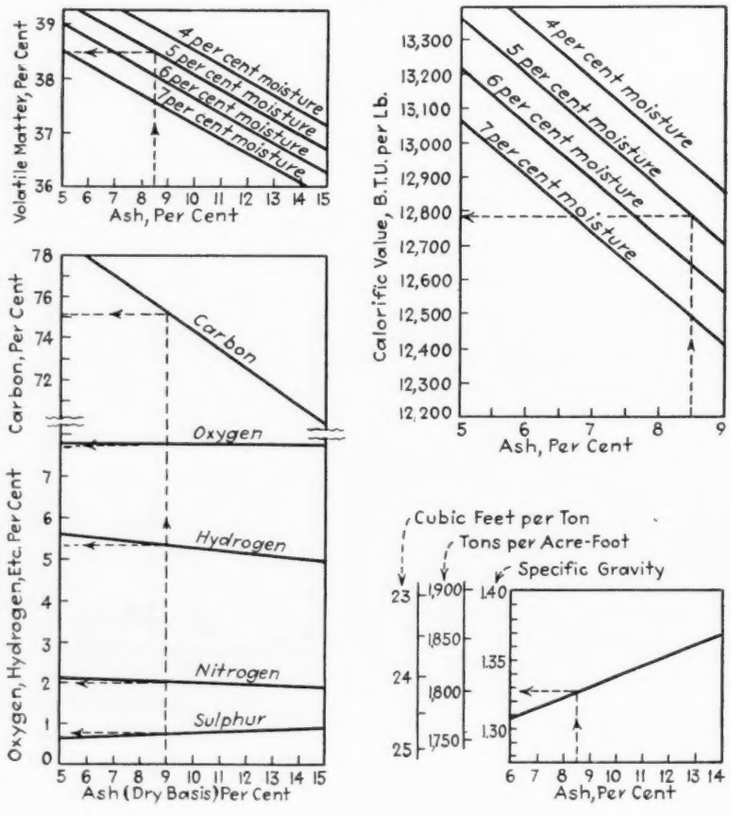
Sixteenth Annual Report, Research Council of Alberta, 1935. Report 33. University of Alberta, Edmonton. 44 pp., 6½x10 in.; paper.

This report covers fuels, geology, road materials, soil surveys and natural gas. E. Stansfield, W. A. Long and K. C. Gilbert report for the Fuels Division and show how, with a given coal, volatile-matter content can be related to ash and moisture, ultimate analysis to ash on a dry basis, calorific value to ash and moisture, cubic feet per ton, tons per acre-foot and specific gravity to ash. In this way the operator who decides to wash to a given ash can determine what the analysis, calorific value, cubic feet per ton, tons per acre-foot and specific gravity of the coal thus prepared will be. All that is necessary is to erect a vertical from the given ash until the inclined line for the moisture, carbon, oxygen, hydrogen, nitrogen, sulphur, or whatnot is reached. Then from that point a horizontal line is drawn to give the value desired on the vertical scale. This seems to work well with the Alberta coals, which vary in a regular manner.

It has been found that the rank of Alberta coals has often been misrepresented unintentionally by quoting the moisture content as found when that moisture is higher or lower than the capacity moisture. In general the moisture actually found is greater than the capacity moisture.

The Wheeler method for finding the ignition temperature of coal grinds the sample to just pass a 200-mesh screen; the coal is then completely oven-dried and slowly heated in a current of oxygen. Two sub-bituminous coals fired at 345 deg. F., but such an experiment failed to furnish information to guide two wet washeries in the design of their drying equipment, so the Research Council crushed the coal to 4x8 in., spread the coal out in a single layer on a wire mesh and passed over it a brisk current of hot air. The lowest temperature of air that would actually ignite one or more pieces of coal within 3 minutes was taken as the ignition temperature. It was found for these coals to be 705 deg. F. When one piece of coal fires, the others will be fired by the ignited piece of coal; thus the firing of one piece is regarded as the crucial test.

Charts Showing Character of Coal Obtained When Ash Is Reduced to Any Given Percentage



OPERATING IDEAS

From Production, Electrical and Mechanical Men

Desk and First-Aid Station Combined for Portability

Progress toward concentration of working areas in coal mining has stimulated the development of portable equipment, and the section foremen's offices and the first-aid stations are not exceptions. A few months ago installation of the combination first-aid cabinets and desks pictured in the illustration, which was made from a shop view, was begun in No. 3 mine in the Powellton (W.Va.) division of the Koppers Coal Co.

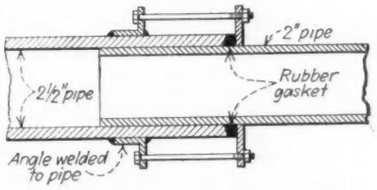
The units are 12 in. deep, 18 in. wide and 7½ ft. long, and the material is ¾-in. yellow pine. In the box will be kept a stretcher, blankets, splints and a first-aid kit. At one corner is a drawer 3 in. high, 25 in. wide and 11 in. deep, in which the section foreman can store and lock his supplies. As installed in the mine the box is mounted on cross-pieces nailed to four posts. The top of the box serves as a desk on which the section foreman can write in making his reports.

Inside of the box, a lamp, fed by wiring protected by conduit, is kept burning to keep the materials dry. Ends are fitted with handles and the total weight, including first-aid equipment, is such that two men can handle it. The overall dimensions permit loading into a mine car for transportation. Because of the almost negligible trouble and expense involved in making a move, this type of "field" office and first-aid station will be kept close to the scene of action.

Shop view of portable desk and first-aid station

Extension Pipe Facilitates Pumping Out Place

To facilitate pumping out dipping places during working hours and at the same time eliminate interference with cutting machines, Walter Iman, Kitzmiller, Md., offers the extension pipe shown diagramatically in the accompanying illustration. This extension pipe slides into the end of the regular pipe line, and the joint is made with one-half of a Dresser coupling and a rubber gasket. Angles are welded to the regular pipe line to form the anchor half of the coupling. During working time, the miner has only to loosen two bolts and slide the extension pipe forward to permit pumping. At the end of the shift, he can slide it back into the clear to permit the machine to cut.



Details of joint for extension pipe

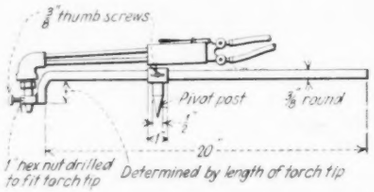
Removing Studs or Taps With Arc or Torch

Asbestos paper and the electric arc or welding torch can be used to good effect in removing a stud or tap which has broken off below the surface, writes John E. Hyler, Peoria, Ill. If it is feared, in the case of a tap, that the weld metal will run down into the tap flutes and bond it to the metal being tapped, tiny bits of asbestos paper can be forced down into the flutes to shut them off, using a piece of wire of suitable size with a perfectly flat end so that it will work properly.

Any revealed wall surface in the hole above the broken stud or tap may be masked off simply by rolling a piece of asbestos paper to form a wall liner. Finally, a washer can be made of asbestos paper with a hole in the center somewhat smaller than the tap or stud hole. This is laid in place and on it is laid an ordinary nut, which is clamped down in any convenient manner. Then, with a small torch flame or with the arc, metal is built up from the top of the broken stud or tap, filling in the center of the nut. After cooling, a wrench is applied to the nut and the assembly is removed. With adeptness in the process, part of the asbestos-paper precautions, depending upon the individual case, may be dispensed with.

Circle Cutting With Torch Aided by Hand Attachment

As a result of several years of experience, R. H. Edwards, Bishop, Va., recommends the circle-cutting attachment shown in the accompanying illustration for cutting circles by hand with the acetylene torch. The torch holder proper is made from a blank 1-in. hexagonal nut drilled to fit the torch tip and fitted with a ⅜-in. thumbscrew.



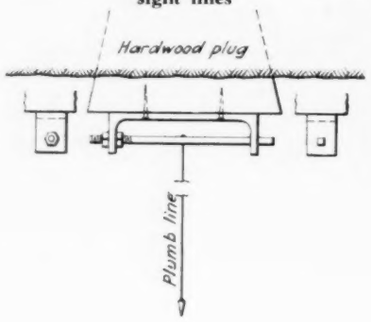
Details of circle-cutting attachment

The pivot post is turned out of 1-in. shafting drilled and tapped for a ⅜-in. thumbscrew. Length of the post is determined by the length of the torch tip. This same consideration also governs the length of that part of the arm turned down to hold the torch holder. With this attachment, Mr. Edwards states, it is possible to work to within 1/64 in. and also make cuts as clean as with a machine cutter.

Attachment Aids Setting Of Sight Lines

To insure the proper alignment of sighting lines when fixed with a transit, the attachment shown in the accompanying figure has been developed by P. W. Brown, mining department, Fife Coal Co., Ltd., Cowdenbeath, Fifeshire, Scotland. The attachment may be mounted on a wooden plug in the roof or suitably clamped to cross beams. By means of the double nut, the sighting line can be brought into proper position. The square neck on the carrying rod prevents it from turning while the sight line is being adjusted by means of the nuts. With this attachment, says Mr. Brown, horizontal wires may be used to drive roads to any gradient.

This attachment facilitates setting sight lines



Hints From a Shopman's Notebook; Cutting Shapes With Lathe

By WALTER BAUM
Master Mechanic, Perry Coal Co.
O'Fallon, Ill.

BY USING the attachment described in this article, the lathe can be adapted to the cutting of shapes with a torch. How the attachment is installed on the lathe is shown in the lower part of Fig. 3. This attachment, which holds the pattern, is made by taking two ⅝x2x2½-in. angles 12 in. longer than the bottom of the lathe bed is wide and drilling them as shown in Fig. 3. After drilling, the angles are clamped to the bottom of the lathe bed, using clamps similar to those described in the article on a torch holder for lathe use (*Coal Age*, March, p. 165). Then two steel plates are cut and drilled as in the figure and are bolted to the angles. Next, two angles, *B-B*, 6 in. long are cut from ⅝x2½x3-in. material, and then are drilled and bolted to the top of Plates *C*, taking care that neither the angles nor plates extend above the top of the lathe carriage. A spacer of 1-in. pipe is inserted between the two plates, which then are drawn up tight to the spacer by a ⅝-in. bolt of the proper length. Then the curved slots are cut in Angles *B-B* with a hand torch. A straight bar is then bolted across the top of *B-B* at an angle to the lathe ways, as indicated by the dotted lines, top part of Fig. 3.

Two spacer-washers, *G-G*, then are made, followed by two strap hooks, *H-H*, of ⅝x1¾-in. steel, one with a ½-in. and the other with a ¾-in. hole. Diameter of the hook is ½ in. How the hooks and spacer washers are installed and also how the springs installed on the hooks pull the guide bar *E* against the pattern of the cut to be made are shown in Fig. 1.

Guide bar *E* was made of ¾x3½-in. mild steel. One end was pointed as in Fig. 3 and was ground smooth so that it would slide easily on the pattern member bolted on Angles *B-B*. The spacer-washers were placed on Bar *E* directly over the T-slots, one in the back and one in the front of the lathe carriage, and their location was marked out with crayon. Then the slots were extended back as far as desired, and were cut out with a hand torch, using care to insure that the spacer-washers would fit snugly yet freely in each slot. The end of Bar *E* opposite the point end was brought out 6 in. past the carriage so that the torch holder shown in Fig. 2 could be bolted on. Angles *A-A*, if desired, also can be brought out past the front side of the lathe to form a good support for the work being cut.

In connection with the use of this

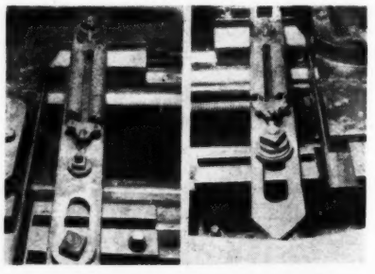


Fig. 1—Showing installation of spacer-washers, hooks and springs on Guide Bar E

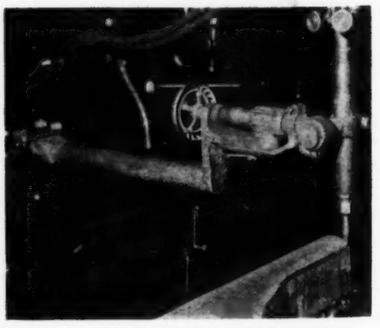


Fig. 2—Cutting torch bolted on work end of Guide Bar E

★

No Bluff

• A bluff sometimes is a good substitute for cards in a poker game, but no problem in the operation of a coal mine was ever solved by making believe you had something when you didn't. The only thing that helps you around the mine is knowledge and ability to apply it. Operating, electrical, mechanical and safety men may acquire knowledge by studying things out themselves or by drawing on the experience of others. This department is designed to make the experience of others available to you, and in turn you are requested to reciprocate. So if you have figured out some new or better way of meeting an operating, mechanical, electrical or safety problem, send us the details, together with a sketch or photograph if it will help to make the description clearer. For each accepted item Coal Age will pay $5 or more.

attachment, it must be remembered that there is a limit to the amount of cross travel available for making cuts. If a half-circle cut is to be made the torch will have to travel farther to complete the cut than in the case of a straight-line cut. This can be taken care of by selecting the proper screw-cutting feed.

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Automatic Tire Arc Welder Installed at Powellton

After several years of experimenting with tire filling by manual arc welding, an automatic welding machine was put in service in the central shop of the Powellton (W.Va.) division of the Koppers Coal Co. on Feb. 15. An engine lathe was fitted with auxiliaries to facilitate the welding and turning operations. Even the two auxiliary motor-generator sets and other control apparatus of the welding head are mounted as a unit with the lathe.

The Powellton machine is a Westinghouse Weldomatic and as used at present it feeds ¼-in. steel electrode from a spool on which 150-lb. rolls are mounted. A column supporting the spool, welding head and shield is mounted on the lathe carriage. The 300-amp. welding current is generated by a Lincoln welder previously purchased for manual operation.

A 42-in. x 16-ft. engine lathe that had been used for tire turning was adapted to the new duty, which, in addition to the welding, includes taking a light cut from the weld to smooth the tread. To afford speed changes for the wide range of work, two automotive transmissions are used between the driving motor and lathe. At one end of the motor a direct-connected four-speed truck transmission handles the higher range of speeds and interposed in a countershaft driven from the other end of the motor is a three-speed passenger-car transmission to handle the lower range of speeds. When one transmission is in use the other must be set in neutral.

One revolution in 3½ minutes is the spindle speed used for most of the tire welding. The carriage feed is adjusted for five threads per inch, or slightly over $\frac{3}{16}$ in. advance per revolution of the tire. The first operation after swinging a truck into the lathe is the application of a gas-torch casing to preheat the tire to a temperature estimated at between 400 and 500 deg. F. Heating is discontinued when welding is begun.

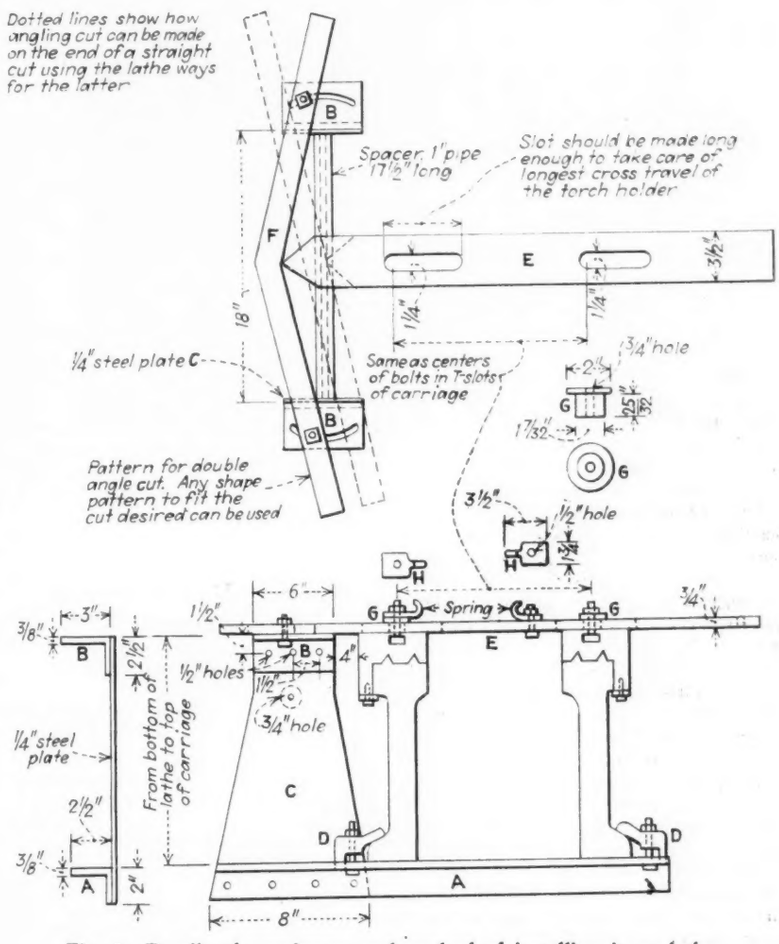
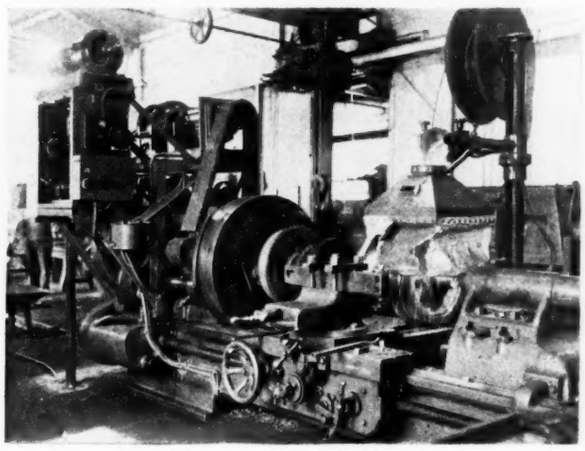
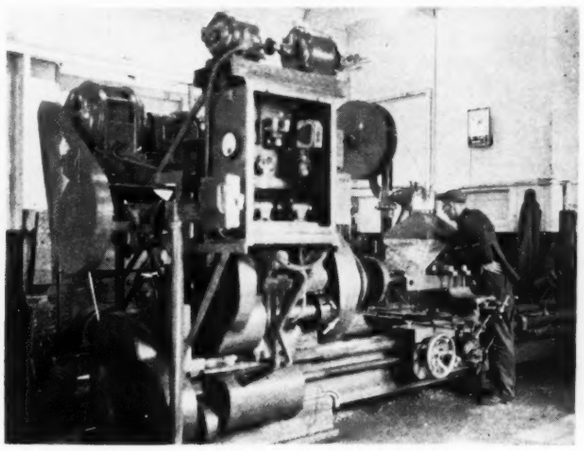

Dotted lines show how angling cut can be made on the end of a straight cut using the lathe ways for the latter
Spacer, 1" pipe 17½" long
Slot should be made long enough to take care of longest cross travel of the torch holder
¼" steel plate C
Same as centers of bolts in T-slots of carriage
¾" hole
Pattern for double angle cut. Any shape pattern to fit the cut desired can be used
½" hole
Spring
½" holes
¾" hole
¼" steel plate
From bottom of lathe to top of carriage
8"

Fig. 3—Details of attachment and method of installing it on lathe

The arc shield has a built-in colored-glass window and a protective shirt of copper-reinforced asbestos cloth



With its double transmission, individual motor drive and welding controls, the lathe is an imposing machine



WORD FROM THE FIELD

Stream-Pollution Measures Headed for Tangle?

Stream-pollution legislation is likely to be involved in a snarl in the Senate and House of Representatives, in the opinion of some Washington observers. The Senate Commerce subcommittee, headed by Senator Caraway and including Senators Guffey and Gibson, does not expect to hold any open hearings on the Barkley, Lonergan, or the already House-approved Vinson bill, Mrs. Caraway has indicated. The group intends to let the full committee decide what measure should be reported to the calendar, although there is a belief that Senators Caraway and Guffey favor the Lonergan bill.

At present no action is to be taken pending an attempt by Senator Lonergan to effect a compromise with proponents of the Vinson-Barkley legislation, his aim being to have included in the Vinson measure at least that part of his bill which relates to enforcement provisions. If that were done, he has indicated, he would get behind the Vinson-Barkley measure rather than fight for Senate passage of his own bill. The Vinson act provides for long-range studies of stream-pollution problems under supervision of the U. S. Public Health Service, with the cooperation of State and other agencies, and extends grants to municipalities and loans to industries to meet pollution problems.

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Larsen Stripping Sold

The Leslie Larsen stripping operation near Madisonville, Ky., has been purchased by the Sentry Coal Mining Co., affiliated with the Sinclair interests headed by Grant Stauffer, Kansas City, Mo. The stripping was opened to recover the "No. 14 Seam," with a thickness of about 8 ft. Average overburden thickness is about 50 ft. Contemplated changes in equipment are expected to be completed about Sept. 15.

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Earle Signs Licensing Act

Both branches of the Pennsylvania Legislature having passed a bill requiring examination and licensing of bituminous miners, Governor Earle signed it, making it a law, on April 29. For many years there has been a law requiring licensing of anthracite miners in the Keystone State, and soft-coal workers desired a similar law with the

idea that experienced and efficient miners would insure a greater degree of safety than inexperienced men. Examining boards will be set up for the issuance of certificates to those who qualify under the law. Should any operators employ men who do not possess legal certificates of qualification they will be subject to fines.

Keeping Step With Coal Demand

Bituminous Production

	1937 (1,000 Tons)	1936* (1,000 Tons)
April 3	7,090	6,538
April 10	5,720	7,392
April 17	6,244	6,822
April 24	6,550	7,132
May 1	6,757	6,864
May 8	6,945	6,840
Total to May 8	167,411	147,929
Month of March	**51,315**	**31,527**
Month of April	**25,735**	**30,452**

Anthracite Production

April 3	1,101	481
April 10	1,586	547
April 17	1,644	1,162
April 24	1,611	1,593
May 1	1,439	1,536
May 8	915	1,335
Total to May 8	20,140	21,836
Month of March	**4,781**	**3,061**
Month of April	**6,576**	**4,773**

*Outputs of these two columns are for the weeks corresponding to those in 1937, although those weeks do not necessarily end on the same dates.

Bituminous Coal Stocks

(Thousands of Net Tons)

	Apr.1 1937	Mar.1 1937	Apr.1 1936
Electric power utilities	8,717	7,922	5,509
Byproduct ovens	9,638	8,687	3,431
Steel and rolling mills	1,897	1,602	817
Railroads (Class 1)	11,031	8,589	4,840
Other industrials*	13,672	11,774	7,356
Total	44,955	38,574	22,133

Bituminous Coal Consumption

(Thousands of Net Tons)

	Apr.1 1937	Mar.1 1937	April 1936
Electric power utilities	3,559	3,213	2,896
Byproduct ovens	6,453	5,738	4,688
Steel and rolling mills	1,372	1,219	1,091
Railroads (Class 1)	8,412	7,722	7,392
Other industrials*	13,452	12,254	9,754
Total	33,248	30,146	25,821

*Includes beehive ovens, coal-gas retorts and cement mills.

Earle Given Three Plans to End Bootlegging

Members of the Pennsylvania Anthracite Commission failed to agree on a solution to the problem of bootleg mining, which has plagued the hard-coal industry in recent years. After several weeks of investigation and study in the mining region, the group gave Governor Earle three different proposals on May 17.

Chairman W. Jett Lauck and James W. Angell, Columbia economics professor, suggested legislation creating a $5,000,000 State corporation to operate abandoned collieries employing up to 7,000 men and producing a tonnage not greater than that credited to bootleg operations. They also proposed that a 5c. per ton tax be placed on the product of the present anthracite operators, to be used to purchase the mines to be operated by the State. When present unhired miners were employed, they suggested, a proclamation should be issued by the Governor against further bootlegging.

State operation of collieries was advocated also by Morris L. Ernst, New York attorney, but he opposed the tax on other producers. He proposed a voluntary cooperative organization of recognized producers, under a minimum of State control. William R. Lynett, Scranton publisher, and Harrison Hoblitzelle, Philadelphia industrialist, recommended application of a modified Guffey act, with provision for additional direct and work relief, with strengthening of the laws against bootlegging.

Governor Non-Committal

Governor Earle forwarded the reports to the Legislature without expressing an opinion, but pointed out that the five commissioners agreed on these three points: (1) Intervention of armed forces to end illegal mining would not be advisable; (2) prices of hard coal should be reduced to meet competition of other fuels; (3) anthracite freight rates should be lowered.

The possibility of federal intervention in the situation created by bootleg mining was discussed by President Roosevelt and Governor Earle at the White House on May 20. The President offered some constructive and valuable suggestions, said Mr. Earle, which the latter said he would take up with operators and United Mine Workers officials. The first essential, he said, "is to cut down the price of anthracite to the consumer. The middlemen are inefficient and uneconomical, but that does not mean that they must be eliminated. The trouble with the anthracite business is: (1) third-

generation absentee ownership; (2) seven companies own 85 per cent of the anthracite lands and are trying to maintain a price structure so high that coal cannot compete with laborless fuels."

Federal regulation of the hard-coal industry is essential to its rehabilitation and the solution of the bootleg mining problem, according to John L. Lewis, president, United Mine Workers. The miners' leader expressed this opinion on May 7 in Philadelphia, Pa., at a conference of coal producers, union officials and others interested in the anthracite situation, called by Governor Earle's Anthracite Coal Industry Commission. Prices, freight rates, profits, earnings and competition were discussed.

"I favor regulation by the U. S. Government by means of legislation similar to the Guffey bill," said Mr. Lewis. "Regulation will go a long way toward solving the problems of hard coal, including the major problem of bootlegging. Solution of the bootleg difficulty, however, will not of itself serve as a cure-all. The chief element in that difficulty is the failure of operators to open their mines. More mines are the best answer."

Among those present were: W. W. Inglis, president, Glen Alden Coal Co.; Ralph E. Taggert, president, Philadelphia & Reading Coal & Iron Co.; Donald Markle, president, Jeddo-Highland Coal Co.; Charles F. Huber, president, Anthracite Institute; Louis C. Madeira, 3d, executive director, Anthracite Institute; Lieutenant Governor Thomas Kennedy, secretary-treasurer, United Mine Workers; Joseph Kerschinsky, president, District 9, U.M.W.; and John Boylan, secretary, Anthracite Conciliation Board.

A confidential census of bootleg operations in Schuylkill, Dauphin, Northumberland and Carbon counties, Pennsylvania, has been started by the Commission, according to Dr. Angell. The tabulation will include the quantity of bootleg coal produced, earnings, profits, sales, expenses, prices, wages, names and personal history, previous occupational status, relief status and education.

Koppers to Open New Field

One of the first major steps in the opening of a new coal field in West Virginia was taken on May 10 with announcement by the Koppers Coal Co. that it had leased 10,000 acres of coal land near Oceana, Wyoming County. J. P. Williams, president of the company, said that a mine will be opened in about twelve months. The Virginian Ry. has let contracts for a 28-mile branch through the mountains to Glen Morrison.

Mr. Williams said that no estimate of annual output has been made; simply that the new operation will replace worked-out mines in other sections.

No major mines operate in the area where the new lease is located, but Wyoming County adjoins Raleigh County, where the Koppers company has large holdings.

Harris & Ewing

New Bituminous Coal Commission members get ready for business

Left to right (seated): Walter H. Maloney, John C. Lewis, Thomas S. Haymond, Percy Tetlow; (standing) Pleas E. Greenlee, Charles F. Hosford, Jr., and C. E. Smith

Soft-Coal Regulation Gets Under Way; Commissioners Take Oath

GOVERNMENT regulation of the soft-coal industry again got under way on May 17, when the members of the new seven-man National Bituminous Coal Commission, which will administer the Guffey-Vinson coal act, as well as the new Consumers' Counsel, were sworn in. The oath was administered by the Secretary of the Interior, Harold L. Ickes, in whose department the Commission has been placed. At a meeting later in the day the Commission elected Charles F. Hosford, Jr., chairman. Chosen for a term of four years, the members were named by President Roosevelt shortly after he signed the bill on April 28, and the nominations were confirmed by the Senate on May 4. The appointees are:

Charles F. Hosford, Jr., operators' representative and chairman of the Commission named under the coal-control act of 1935, was born in 1887 and graduated from Princeton in 1908 and Harvard Law School in 1911. He became interested in several coal mines in Butler County, Pennsylvania, in 1916 and was president and general manager of the Erie Coal Mining Co., later known as the Butler Consolidated Coal Co., in 1923. In 1931 he served as a member of the Bituminous Coal Commission named by Governor Pinchot, became a member of the NRA Code Authority for Western Pennsylvania and finally, in 1934, was made its manager, when he disposed of his coal interests. For a time he also was a director of the Coal Control Association of Western Pennsylvania.

Col. Thomas S. Haymond, operators' representative, formerly of Fairmont, W. Va., and general manager of the Elk Horn Coal Corporation, Fleming, Ky., has been associated with the coal industry for many years. He also is president of the Big Sandy-Elkhorn Coal Operators' Association.

Percy Tetlow, miners' representative and a member of the Commission named in 1935, is a former member of the United Mine Workers, having been president for some years of District 6. At one time he was commissioner of arbitration in the Kansas field, served for some years as a member of the Ohio Legislature, and was a member of the Ohio fourth constitutional convention, in 1912, and first Director of Industrial Relations of that State, 1921-22.

John C. Lewis, miners' representative, has lately been president of the Iowa Federation of Labor.

C. E. Smith, newspaper editor, of Fairmont, W. Va., representative of the public and a member of the 1935 Commission, was born there in 1885 and educated at Virginia Military Institute and West Virginia University. He began newspaper work in 1907 and was editor of the Fairmont *Times* from 1917 to 1935. From 1920 to 1923 he also was president of the Big Four Coal Co.

Walter H. Maloney, a representative of the public and a hold-over from the old Commission, is a well-known attorney of Kansas City, Mo. He was born in Buffalo, Wis., and received a Bachelor of Laws degree at the University of Michigan.

Pleas E. Greenlee, representative of

the public, comes from Shelbyville, Ind. He was secretary to former Governor McNutt of Indiana during his term of office, resigning in 1935 and being a candidate for Governor in 1936. He has been an active newspaperman in Shelbyville and Michigan City, Ind.

John Carson, of Detroit, Mich., the new Consumers' Counsel, also has had an extended career as a newspaperman. He also was secretary to the late Senator Couzens of Michigan and subsequently was secretary of the Maritime Commission in Washington.

F. Witcher McCullough, Huntington, W. Va., who was selected on May 20 as secretary of the Commission, is 48 years old and an attorney. A graduate of the College of Law of West Virginia University, he was appointed in 1933 a member of the legal staff of the Public Works Administration, resigning in 1934 to accept appointment as West Virginia State director of the National Emergency Council. Later the same year, he was appointed State director of the National Emergency Council. Shortly thereafter, he was appointed State Director of NRA, and the following year became Works Progress Administrator for West Virginia.

John L. Steinbugler, New York City, who has been appointed acting general counsel of the Commission, was formerly president of William C. Atwater & Co. His long experience in the coal industry gives him the proper background for the post.

Voice From Southwest Heard

Some suggestions for prompt benefit to the industry under the new law, especially from the standpoint of the Southwest, were offered in a letter to Commissioner Maloney from J. G. Puterbaugh, president, McAlester Fuel Co., McAlester, Okla. The letter read, in part:

"If the Commission recognizes that the first and important thing from the standpoint of the industry is to establish a 1937 price schedule for each district, and will then see that anyone who violates those prices is promptly and severely dealt with, and will decentralize and delegate authority to such extent as may be necessary to bring about prompt action on these two points in all sections of the country, the possible benefits of this legislation can be saved to the industry and the country this year, and in the succeeding weeks and months the thousand and one less important matters that will arise can receive more deliberate consideration. I would emphasize, however, that if the 80 per cent of the producers who always have been and are now willing to proceed along correct lines are tied to an established price, and the 20 per cent who always have been and are still willing to take advantage of their neighbors and to demoralize the industry by cutting the established price are not promptly called to account, this administration, like the administration of the coal business by N.R.A., will miss the mark and fail to accomplish the one big thing it is designed to accomplish and that is necessary to stabilize the industry and make it a national asset instead of a national liability.

Harris & Ewing

John Carson

Consumers' Counsel

"In my opinion, the industry in the Southwest will be better off if we have one fixed annual price for each size and quality of coal. However, in this, as in all other matters, I believe that the decision of a majority of the groups involved should govern, and that the Commission will do well not only to urge but insist upon the maximum amount of local self-government, in the realization that a large majority of the producers in each group are loyal and substantial Americans who, if trusted and appealed to in the right manner, can be depended upon to apply to the solution of this great national problem the intelligence and understanding they have acquired of it through long years of experience and struggle."

There has been some speculation anent the term "arms' length transaction," appearing in Sec. 3 of the act. It is reported that the expression was put in the bill at the suggestion of the Department of Justice, the underlying idea being that in an ordinary sale the seller and purchaser hold each other at arms' length and obtain the best terms possible. When the seller and purchaser get closer together for any reason, however, the sale is made "otherwise than through an arms' length transaction." An ordinary sale is an arms' length transaction, but the disposition of coal from a captive mine is not usually such a one.

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Permissible Plate Issued

One approval of permissible equipment was issued by the U. S. Bureau of Mines in April, as follows: Sullivan Machinery Co., Type 8-B shortwall mining machine; 50-hp. motor, 250 volts, d.c.; Approval 315; April 28.

More Mine Pacts Signed Increasing Wages

Wage controversies in outlying fields were largely cleared up during the past month with settlements carrying the same relative increases as the new Appalachian agreement ratified April 2 in New York (*Coal Age*, May, p. 231). In western Kentucky, an agreement was reached on April 27 by operators and United Mine Workers officials representing more than 7,000 miners in Muhlenberg, Ohio, Hopkins, Webster and Daviess counties. Operators employing about 4,000 workers in Christian, Hopkins and Webster counties signed a similar pact with the Independent Miners' Union.

Three major Alabama producers signed up on May 3, after several futile efforts to compromise on wage demands. Two days later, the Tennessee Coal, Iron & Railroad Co. capitulated, and on May 8 the remaining companies came to terms on the original demands of the U.M.W. M. C. Hughes, conciliator for the State Department of Labor, brought about the settlement. About 20,000 men were idle for more than five weeks.

Arkansas and Oklahoma operators accepted terms on May 10 at a meeting at Fort Smith, Ark. Most of the 7,500 miners in the two States were affected by the new pact, although a number of operators had signed independent contracts with the union. On May 12 a settlement of the strike at the two mines of the Blue Diamond Coal Co., in Southwest Virginia, was effected. James Duncan, labor leader, said both sides made concessions on wage and hour clauses. Union men at four mines of the Stonega Coke & Coal Co., totaling 1,500, who had been on strike demanding a "closed shop," also have returned to work following an announcement by John L. Lewis, U.M.W. president, that the closed shop was illegal in that area and an order that the men go back to work.

Tonnage Capitulates

New contracts applying to mine workers in captive mines of the United States Steel Corporation in western Pennsylvania were signed May 18 after several weeks of negotiations between Thomas Moses, president of the coal companies, and P. T. Fagan, president of District 5, U.M.W. Nearly 13,000 miners employed by the H. C. Frick Coke Co., National Mining Co. and Sharon Coal & Limestone Co. are affected.

No formal contracts have been signed in Illinois, the rival union groups awaiting an opportunity to outdo each other in the struggle for preeminence, but most of the mines continue to work, with the understanding that any wage increases that may be agreed upon will be retroactive.

The seven-hour day and five-day week went into effect in the anthracite fields

of Pennsylvania on May 1, in accordance with the wage contract agreed to on May 8, 1936 (*Coal Age,* June, 1936, p. 267). There was no celebration or untoward incident in connection with the change except for controversies at some mines over the starting time of men on the night shift. Most of the men wanted to start work at 2:30 p.m. instead of the former starting time of 3:30.

Obituary

OZNI PORTER HOOD, 71, until recently chief, technologic branch, U. S. Bureau of Mines, died April 22 at his home in Washington, D. C., after a long illness. A graduate of Worcester Polytechnic Institute and Rose Polytechnic Institute, he was professor of engineering at Kansas State Agricultural College for nine years; professor of mechanical and electrical engineering at Michigan College of Mines for thirteen years, and served as chief mechanical engineer with the Bureau of Mines at Pittsburgh, Pa., before going to Washington.

JOHN M. YOUNG, 60, vice-president in charge of anthracite sales, Madeira, Hill & Co., Philadelphia, Pa., died April 30 at his home in Cynwyd, Pa., following a heart attack.

JESSE TARLETON MOORMAN, 67, president, Patoka Coal Co., operating at Oakland City, Ind., died May 15 in Indianapolis, after an illness of nearly a year. Besides his association with the coal industry he had had extensive industrial and political interests.

ANDREW C. RAMSAY, 55, vice-president of the New Castle Coal Co., Birmingham, Ala., where he was well known as a mining engineer, died at his home there on April 26 after a four-day illness of pneumonia. A graduate of Lehigh University, he moved from Pennsylvania to Birmingham shortly after leaving college, becoming associated with his brother, Erskine Ramsay, in the Ramsay Engineering Co.

ROBERT L. BROWN, 67, chairman of the board, Brown Coal Co., Cotula, Tenn., died May 4 at his home in Memphis. He had been active in the coal industry for nearly forty years, having owned coal properties in Alabama previous to the World War and later heading both the Gibraltar Coal Mining Co. and Mercer Coal Co., in Kentucky. During the World War he represented west Tennessee on the U. S. Fuel Administration.

GEORGE ALFRED STORRS, 73, prominently identified with the coal-mining industry for many years, died May 3 at a Salt Lake City hospital following an apoplectic stroke. He had been associated with the Jesse Knight interests in the Spring Canyon Coal Co., Carbon County; supervised development work on the Spring Canyon site, and directed the building of the adjacent town of Storrs, which was named for him.

Regulation of British Mining Industry Wins Widespread Acceptance

By PAUL WOOTON
Washington Correspondent
McGraw-Hill Publications

FUNDAMENTAL problems incident to the production, distribution and utilization of coal are being attacked in a most determined way in the United Kingdom. Development of the coal industry in the British Isles through the years was on the same haphazard basis as in other countries, but, since British industry is built upon coal, there has been more insistence of late upon efficiency there than elsewhere. New plans to that end now are well under way. In many ways the British are pioneering in a field into which the United States and other coal-producing nations, sooner or later, must go.

There is a striking contrast between the functioning of the British coal industry during the depression and that of the United States. The British went through the depression with a shrinkage of market fully as great as that experienced in the United States, but without reducing wages. More than that, the industry stayed in the black throughout.

In the United States, in 1933, the coal industry reported to the Treasury a net loss of $58,406,000. In that year the British had a small but nevertheless real credit balance of £2,177,540. In 1934 the credit balance of the British industry was £4,128,199, while in 1935 it was £5,203,580. In 1934 the American coal industry made a better showing than in 1933, but returns to the Treasury still showed an over-all loss.

The more favorable showing of the British industry was due, in part, to the stimulating effect upon an industry, in which the export trade constitutes a large part, of the devaluation of the pound. No small part of the favorable showing, however, the British are agreed, must be ascribed to the Coal Mines Act of 1930.

Close comparison of the industries in Britain and in the United States yields an impressive indication of the benefits of market control. In that connection the statement is made that the fears of the classical economists, that such regulation would put a premium on inefficiency, have not been borne out. There is impressive evidence that the British coal-mining industry has progressed more rapidly in terms of operating efficiency since 1930 than it did before that year. If allowance is made for different physical conditions in the two countries it seems apparent that the British have gone ahead much more rapidly than did the American industry in its program of mechanization. At the moment, further stimulation of mechanization in the United Kingdom is seen in the government's excess profits tax bill (national defense contribution).

Prices are being regulated in Britain but provision also is made for control of production. It has at least that advantage over the Guffey act. Distribution is being directed on a national basis. "Oil-from-coal" research is being carried out on a broad front. A more definite plan for the handling of export problems is in the making.

Permanent Stabilization Seen

Representatives of owners, of labor and of consumers were interviewed in England recently by this writer. Each of them feels that great progress has been made and that there is every promise of getting the industry permanently on a more business-like basis.

While collective bargaining is in a much more advanced stage in the United Kingdom than in the United States, it has not worked as well in coal mining as in most other British industries. Strangely enough, most of the recent difficulties have revolved around questions other than wages. Various wage agreements have been worked out thus far this year with very little difficulty and with an almost complete lack of bitterness.

Just before the recent strike vote was taken on the question of recognition of the Mine Workers' Federation in Nottinghamshire an agreement as to wages

Coming Meetings

- Indiana Coal Mining Institute: summer meeting, June 5, Vendome Hotel, Evansville, Ind.
- American Retail Coal Association: annual meeting, June 7-12, Palmer House, Chicago.
- Illinois Mining Institute: annual summer meeting and boat trip, leaves St. Louis, Mo., June 11 on Str. "Golden Eagle," returning June 13.
- Mine Inspectors' Institute of America; annual convention, June 21-23, Deshler-Wallick Hotel, Columbus, Ohio.
- Mining Society of Nova Scotia: annual meeting, June 21-23, at Nova Scotian, Halifax, N. S.
- American Society for Testing Materials: annual meeting and exhibition, June 28-July 2, Waldorf-Astoria Hotel, New York City.
- Southern Wyoming Coal Operators' Association: annual meeting, July 13, Cheyenne, Wyo.

was reached in Wales. After dispassionate and painstaking deliberations at which all angles of the situation were studied, wage increases aggregating £750,000 were agreed upon. Miners will receive an increase of 2s. 2d. (53c.) a week. Other labor will receive increases of from 5s. to 10s. weekly.

An interesting phase of this agreement is that it was the first one ever negotiated during the life of an existing agreement. The effective date is Sept. 30, but the operators voluntarily allowed it to become operative immediately, giving the mine workers the advantage of the higher pay for nearly six additional months. The operators wanted the agreement to run for five years; the mine workers wanted a three-year agreement. Finally they split the difference and the agreement will run for four years, or until Sept. 30, 1941.

No one with whom the writer talked took a pessimistic view of the labor situation. While it was expected that difficulties would be experienced as the new schemes are being worked out, the general belief seems to be that no major or prolonged clash is in prospect. Labor is reconciled to a mechanization program and realizes that some 30 per cent of those experienced in mine work will have to look to other occupations for employment. This inability of the industry to absorb all miners would remain equally true were labor to achieve its proposal that coal production be brought under public ownership. That proposal does not command enough public support to make it likely of early realization, but there is more sentiment for public ownership of certain mines in depressed areas.

Strike a Passing Incident

The recent strike vote involved nothing particularly fundamental. The principal issue was the recognition of the Mine Workers' Federation in the Nottinghamshire district. The operators made an agreement with the Nottinghamshire Miners' Industrial Union which aroused the ire of the Nottinghamshire Miners' Association, the local affiliate of the Mine Workers' Federation, the national organization. Out of this grew a collateral question as to possible discrimination against members of the Miners' Association at the Harworth mine, where a change from a double shift to a single shift made necessary the reduction of the working force from 2,000 to 1,100 men. At no time was there real apprehension that this would be more than a passing incident.

In Northumberland the new wage scale proposed by the operators was accepted by the Miners' Council without a threat of trouble. Scotland may prove to be an exception to the experience in most other districts. Some bitterness has developed in the dispute over wages there. Some 90,000 men are involved, but as this is written there are still chances for an amicable settlement.

Wages paid in 1936 to coal miners in England, Scotland and Wales totaled £94,190,149. This was nearly £9,000,000 more than the total of wage payments in 1935. A portion of the increase came through the profit-sharing feature of the wage agreements. Additions to payrolls in 1937 are expected to be even larger.

British operators, at first unenthusiastic about the quota system, established under the Coal Mines Act of 1930, now think it is feasible and practicable as it is being conducted under the amended act. Not all consumers share this opinion. The act was one of the major items on the legislative program of the labor government and the mine workers have cooperated in the efforts to make it succeed. The mine workers, however, charge the operators, among other things, with deliberately impeding the consolidation of properties. In view of the fact that production quotas are transferable from mine to mine there can be no doubt that many companies have closed down high-cost mines and have concentrated their production in low-cost properties. Some of this may have been offset by the opening of new mines, but, now that the government is to buy in all coal-mining royalties, that phase of the situation will be under better control than heretofore.

Nationalization of royalties also will greatly facilitate the merging of properties. The price to be paid for royalty rights is £66,450,000. The owners had asked £112,000,000 but agreed to abide by the decision of an impartial tribunal. No one expected the amount of compensation to be less than £100,000,000, so the low figure came as a surprise.

While the looseness with which the act was administered prior to Aug. 1, 1936, gave no thorough test of the quota system, enough promise was shown to insure wholehearted cooperation of all concerned after that date. Nearly every one is willing to admit that it has been an important influence in stabilizing prices, in increasing operating efficiency and in checking cutthroat competition. Few in the United Kingdom question any longer the feasibility of market regulation. The plan gives every inducement to reduce production costs, so that mechanization has been stimulated. Within five years, it is estimated, two men will produce as much coal as three men do today. Under the present abnormal demand the flexibility of the quota system practically allows each mine to produce to the limit of its capacity.

Quotas in each district are fixed by district boards but must be approved by the Central Council of Colliery Owners. There are separate allocations for export and for the different special classes of coal. The Central Council fixes and coordinates the minimum prices that may be charged. One effect has been to increase materially average weekly earnings of mine workers and to reduce the amount of part-time work.

Although the increased demand for coal in the home market and the upturn in export orders have had the effect of quieting somewhat the demand for a subsidy on export coal, prospects favor such legislation. There have been months when Germany's exports exceeded those of the British Isles. The disposition is to put British producers in a position to meet subsidized competition. German subsidies are said to average four marks ($1.60) per ton.

Distribution Being Scanned

Distribution problems have had relatively little consideration in the United Kingdom. Under the new powers granted the Central Council these matters are being taken up in an intensive way with the idea of decreasing the spread between the mine price and that which the consumer pays. Not all districts have central selling agencies. In the exporting districts, and in some others, there simply is central control of selling. Each mine continues to sell its own output, but no contract may be made without the approval of the district board. Some of the larger districts are divided into sections, each with its own selling agency, but their work is coordinated through the district board. Price policies in the different districts are then coordinated by the Central Council.

The quota system is blamed by some consumers for nearly every difficulty that arises in coal. Some consumers of slack say the quotas have raised their prices out of proportion to those of other sizes. The real reason, it is explained, is that the demand for slack has exceeded the supply produced naturally. As a result it has been necessary to crush other sizes, with a corresponding addition to the cost.

Special committees have been set up to deal with complaints from consumers. The number of complaints has increased with the rise of coal prices and with the difficulties of securing at will any one of twenty sizes or grades. Half of the membership of these committees is made up of consumers, the other half being composed of equal numbers of operators and mine workers. The chairmen of the committees are chosen by the

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WORKS 78 YEARS IN MINES WITHOUT AN ACCIDENT

Harry Carrol, of Wolf Run, Ohio, not only is the oldest active coal miner in the United States but holds the longest no-casualty record. He is 88 years old, has been working at coal mining since he was ten years old and has never had a lost-time accident. The nearest he came to spoiling his record was on his 88th birthday, when he jammed his thumb, but, though it became swollen, he did not find it necessary to lay off. He shovels coal in the Warner collieries at Wolf Run. He says he intends to keep on working as long as he is able to wield a shovel.

Cadwallader Evans, Jr.

Minister of Mines. If the committees are not unanimous in their decisions on a complaint, the chairman makes the decision. In this way prompt action is taken. The decision is binding upon the Central Council and local boards.

German success in large-scale production of motor fuel from coal has served to stimulate British interest in the subject. Much already has been done both in the way of research and in commercial-scale operations. There is much criticism of the government for its failure to appropriate more liberally for that work. Low-temperature carbonization is well established, as there is a ready market for the smokeless fuel produced. The emphasis being put on this development may be judged from the attention given the recent opening of a new 500-ton plant at Chesterfield by the Low Temperature Carbonization Co. The Duke of Kent made the address of the day, in which he stressed the national interest in producing domestically as much oil as possible. Work is in progress at this particular plant on an additional 250-ton unit. A contract also has been let for a distillation plant.

Only one hydrogenation plant is being operated on a commercial scale in England. The success of that plant, which is operated by the Imperial Chemical Industries at Billingham, has prompted further development of that character. Operation of such plants without loss is possible, it is said, only by the remission of the four-pence duty under the Hydrocarbon Oils Production Act approved in 1934. The government has objected to large outright expenditures on the ground that very little employment is produced at such plants. Because of its bearing on preparedness for war a subcommittee of the Committee on Imperial Defense is being appointed to study all processes.

A fuel consisting of 60 per cent crude oil and 40 per cent powdered coal has been developed, for which much is being claimed. Its early adoption by the Cunard line as its standard fuel is said to have been decided upon.

The fact that France has not had a coal mine disaster since 1930 has aroused an insistent demand in the United Kingdom for more effective safety regulations. Deaths from mine explosions in British mines have been higher since 1930 than in the six years preceding that date. The Royal Commission on Safety in Coal Mines has been holding public hearings and is considering more drastic regulations. The gaseous character of many British mines makes the safety problem a much more difficult one than in France.

Personal Notes

CHARLES AIKENS has been appointed superintendent of the Costanza mine of the Wheeling Coal Co. and the Richland mine of the Wheeling Valley Corporation, Wheeling, W. Va.

M. M. ASHBROOK has been placed in charge of the entire electrical equipment of the Jewell Ridge Coal Corporation, Jewell Ridge, Va.

WALTER L. BANTA, assistant general sales manager, Lehigh Navigation Coal Co., Philadelphia, Pa., has been appointed general sales manager, vice G. W. Seiler, resigned.

A. G. BARRETT has been made general foreman at the Glen White mine of the Koppers Coal Co., Glen White, W. Va.

CHARLES BELL, foreman at Carbon Hill operations of the Brookside-Pratt Mining Co., Walker County, Alabama, has been promoted to superintendent.

W. A. BELL, formerly superintendent of the Carbon Hill mine of the Brookside-Pratt Mining Co., Walker County, Alabama, has been appointed superintendent of the Blossburg-Lindbergh division.

ALEXANDER BONNYMAN has been elected president of the Blue Diamond Coal Co., vice James Bonnyman, deceased. His headquarters will be in Cincinnati, Ohio. The company has operations in Kentucky, Tennessee and Virginia.

C. G. COLEMAN has been named foreman at the Lynchburg mine of the Lynchburg Coal & Coke Co., Kyle, W. Va.

ROBERT COOPER has been appointed foreman at the No. 7 mine of the United States Coal & Coke Co., Elbert, W. Va.

JOHN C. COSGROVE announces his resignation from the office of president of the West Virginia Coal & Coke Corporation, effective July 1. After ten years as head of the company, he plans the opening of an office as consulting engineer.

JOHN W. DAVIN, assistant to President W. J. Harahan, of the Chesapeake & Ohio Railway Co., has been promoted

E. P. Humphrey

to the vice-presidency of the Western Pocahontas Corporation and the Western Pocahontas Fuel Co., subsidiaries of the railroad. He will continue as assistant to Mr. Harahan.

IRA F. DAVIS, connected with the Chesapeake & Ohio Railway Co. for the last 20 years, has been made chief engineer of the Western Pocahontas Corporation and the Western Pocahontas Fuel Co., subsidiaries of C. & O.

CADWALLADER EVANS, JR., previously general manager, Hudson Coal Co., has been elected vice-president and general manager, with headquarters at Scranton, Pa. He succeeds A. M. Fine, vice-president, deceased.

L. E. FERRELL has been made foreman of the Star Slope mine of the Dixport Coal Co., Cinco, W. Va.

G. B. FILLMORE has been advanced from general sales agent to vice-president in charge of sales of the Hudson Coal Co., with headquarters at Scranton, Pa.

G. W. HAGY has been made chief engineer of the power department of the Jewell Ridge Coal Corporation, Jewell Ridge, Va., vice Henry Tunsburg, Jr., resigned.

JOHN HARVEY, formerly superintendent of the Penn Anthracite Collieries Co., Scranton, Pa., has been made general superintendent of the Wyoming Valley Collieries Co., with two mines in Luzerne County, Pennsylvania.

E. P. HUMPHREY, assistant to the president, Stonega Coke & Coal Co. and Westmoreland Coal Co., operating in Virginia and Pennsylvania, respectively, has been elected vice-president of both companies. Prior to becoming associated with these companies he was connected with the Lehigh Coal & Navigation Co.

H. B. HUSBAND has been appointed assistant chief engineer of the Western Pocahontas Corporation and the West-

ern Pocahontas Fuel Co., subsidiaries of the Chesapeake & Ohio Railway Co. He was formerly operating head of the C. & O. fuel mine properties at Dorothy, W. Va.

J. B. JAMES has been named foreman at the Oakwood mine of the New River Co., Carlisle, W. Va.

ERNEST D. LEMAY, formerly assistant to J. L. Perry, president, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been made head of the company's newly created department of public relations.

F. B. LIVELY has been appointed night foreman at the Dabney mine of the Hutchinson Coal Co., Kleenkoal, W. Va.

F. A. MARSH, formerly superintendent, Empire mine, DeBardeleben Coal Corporation, Empire, Ala., has been made chief engineer in charge of repairs and construction in the coal-mining department of the Brookside-Pratt Mining Co.

R. M. MARSHALL, secretary, Woodward Iron Co., Woodward, Ala., has been elected vice-president, but will continue also as secretary.

T. W. MATHER has been made foreman of the Warwick and Orkney mines of the Kingston Pocahontas Coal Co., Hemphill, W. Va.

JOSEPH H. NUELLE, president, New York, Ontario & Western Ry., and newly elected president of the Lehigh Coal & Navigation Co. (*Coal Age*, April, p. 170), has applied to the Interstate Commerce Commission for permission to become president of the following roads: Lehigh & New England Railroad Co., Pochuck Railroad Co., Campbell Hall Connecting Railroad Co., Nesquehoning Valley Railroad Co., Tresckow Railroad Co. and Wilkes-Barre & Scranton Railway Co. He said he had been elected president of the six companies and asked to be allowed to perform the duties of the positions.

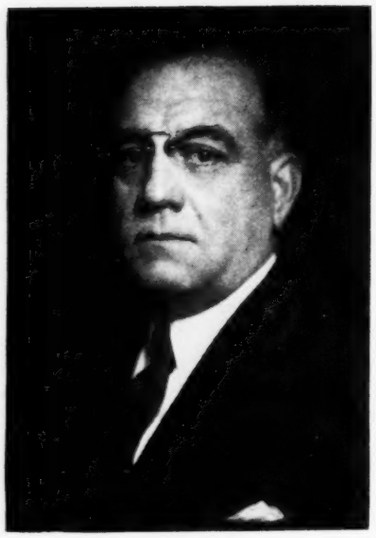
J. J. PHILLIPS has been appointed superintendent of the Fairfield coke works of the Tennessee Coal, Iron & Railroad Co., vice A. H. Chalmers, promoted to assistant general superintendent, Fairfield tin mills.

GEORGE RAMAGE has been named foreman of the Emily mine of the Monongahela Rail & River Coal Corporation, Morgantown, W. Va.

GEORGE W. REED, vice-president, Peabody Coal Co., Chicago, has been elected a director of Appalachian Coals, Inc.

W. M. ROBSON, formerly general superintendent of coal-mining operations, Brookside-Pratt Mining Co., Birmingham, Ala., has resigned.

GEORGE SIMS, formerly superintendent at New River mine, Brookside-Pratt Mining Co., Winfield, Ala., has been made superintendent of the Company's New River-Carbon Hill division.



Harry A. Smith

HARRY A. SMITH, hitherto vice-president of the Delaware, Lackawanna & Western Coal Sales Co., distributing unit for the Glen Alden Coal Co., Scranton, Pa., has been made president of the former company. He succeeds Eliot Farley, who submitted his resignation on May 5. Born and educated in Scranton, Mr. Smith has been with the D. L. & W. coal department for 40 years.

ROY THREADGILL, formerly chief electrician, has been promoted to the position of superintendent of New River mine of the Brookside-Pratt Mining Co., Winfield, Ala.

HENRY TUNSBURG, SR., chief engineer of the power department of the Jewell Ridge Coal Corporation, at Richlands, Va., has severed his connection with that company.

G. E. VIA has been appointed superintendent of the Leccony Smokeless Coal Co., Besoco, W. Va.

R. T. WEST has been appointed general superintendent of the three operations of the Detroit Mining Co. at Gordon, W. Va. (The change was announced in the May issue of *Coal Age*, but there was a typographical error in Mr. West's initials.)

R. L. IRELAND, JR., executive vice-president, Hanna Coal Co., was reelected president of the Ohio Coal Control Association at its annual meeting. WILLIAM EMERY, JR., president, Cambridge Collieries Co., also was reelected vice-president. EZRA VAN HORN is executive vice-president. D. F. HURD was chosen secretary-treasurer.

C. E. RALSTON, vice-president, Benedict Coal Corporation, St. Charles, was elected president of the Virginia Coal Operators' Association at its annual meeting. P. F. BROWN, general manager, Splash Dam Coal Corporation, was chosen vice-president. GEORGE H. ESSER is secretary-treasurer.

Setback to Hard-Coal Code Rouses Hartneady Ire

A new anthracite mine code prepared by Michael J. Hartneady, State Secretary of Mines, and introduced in the Pennsylvania Legislature on April 26 by Senator Joseph Dando, of Schuylkill County, received a setback when a Senate committee voted, 9 to 1, on May 5 against reporting the measure. Senator Dando cast the only favorable vote. On learning of the committee's action, Secretary Hartneady, a former district president of the United Mine Workers, accussed his former colleagues of treachery. The code, he said, was drafted, after many months of deliberations, to make conditions more safe for the miners.

The new instrument, a lengthy one, provided for extensive revision of the regulations governing the hard-coal industry, designed to safeguard the workers. Eight inspection districts were called for in the measure, as follows: (1) Luzerne County; (2) Lackawanna; (3) Carbon; (4) Schuylkill; (5) Northumberland; (6) Columbia; (7) Dauphin; (8) Susquehanna, Wayne and Sullivan. The Governor was to appoint the mine inspectors, nine to officiate in the First district, six in the Second, one in the Third, four in the Fourth, two in the Fifth, and one each in the Sixth, Seventh and Eighth.

A further sequel to the squabble over the proposed change in the code was the suspension of Secretary Hartneady by District 7, United Mine Workers. This action was taken on a unanimous vote of the general mine committee on May 14.

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New Preparation Facilities

BUCK RUN COAL CO., Buck Run, Pa.: contract closed with Wilmot Engineering Co. for additional facilities consisting of Hydrotator classifier and cleaning equipment for recovery of and cleaning Nos. 4 and 5 buckwheat; capacity, 30-40 tons of prepared coal per hour; to be in operation about June 15.

ELK HORN COAL CORPORATION, Mine No. 28, Wayland, Ky.: contract closed with Fairmont Machinery Co. for complete new steel tipple with shaker screens, five loading booms, two-stage crushing and remixing equipment, coal-blending facilities, fine-coal screening plant, two-car rotary dump, facilities for oil treatment and inspecting coal, and complete refuse- and rock-disposal equipment; capacity, 500 tons of mine-run per hour.

GOOSE CREEK MINING CO., Garrett, Ky.: contract closed with American Coal Cleaning Corporation for American pneumatic separator, Type RY, and auxiliary equipment to clean 50 tons of 2½ x 0-in. coal per hour; to be completed about June 10.

ISLAND CREEK COAL Co., Holden, W. Va.: contract closed with Interstate Equipment Corporation for installation of Interstate automatic aerial tramway systems for refuse disposal at Mines No. 7, 14 and 20. All three installations will be similar, with interchangeable main units. Distance to the dump at No. 7 mine will be 1,300 ft., and the dump site will accommodate the output for 21 years at an average rate of 70 tons per hour. Storage space 2,500 ft. distant from the plant at No. 14 will provide for over 70 years' output at 60 tons per hour. Average haul at No. 20 mine will be 1,750 ft., and storage space for 30 years at 100 tons per hour will be provided. All three units, scheduled to start operating about Sept. 1, are arranged for automatic feeding.

KELLY-CARTER COAL Co., Garland, Kan.: contract closed with McNally-Pittsburg Manufacturing Corporation for tipple and washery incorporating McNally-Norton vertical pick breaker and McNally-Norton automatic washer to clean 6x0-in. coal and classify into five sizes and load on five tracks with mixing facilities; capacity, 250 tons per hour.

NATIONAL MINING Co., No. 1 mine, Sygan, Pa.: contract closed with Robins Conveying Belt Co. for equipment to treat lump, egg, nut and slack, including apron feeder 60 in. wide x 13-ft. centers, two Robins 72-192 double-deck Gyrex screens, Robins double-deck vibrating chute, two combination picking tables and loading booms, one cross flight conveyor 36 in. wide x 39-ft. centers, one crushed-coal flight conveyor 36 in. wide x 56½-ft. centers, one nut belt conveyor 30 in. wide x 9½-ft. centers, a central greasing system, and chutes and hoppers. Mine-run is to be delivered from customers' dump hopper to apron feeder at rate of 420 tons per hour, being fed to screens and picked, mixed and loaded into railroad cars on four tracks; probably will be completed this month.

RED JACKET COAL CORPORATION, Keen Mountain operation, Grundy, Va.: contract closed with Fairmont Machinery Co. for headhouse and conveyor system equipped with trip feeder, rotary dump, and rock-disposal equipment; rope-and-button conveyor about 1,240 ft. long in steel gallery and belt conveyor about 400 ft. long carried in a steel gallery; capacity, 400 tons of mine-run per hour.

SENTRY COAL Co., Madisonville, Ky.: contract closed with McNally-Pittsburg Manufacturing Corporation for strip-mine tipple and washery incorporating McNally-Norton vertical pick breaker and two McNally-Norton washers for 6x0-in. coal, classifying into six sizes and loading on six tracks with mixing facilities; capacity, 400 tons per hour.

UNIVERSAL COAL WASHING Co., Pinckneyville, Ill.: contract closed with McNally-Pittsburg Manufacturing Corporation for McNally-Norton automatic washer to clean 3x0-in. coal; capacity, 250 tons per hour; addition to existing plant.

Differences in Rates of Heating Show Marked Effect on Coke Buttons

THE PLASTICITY developed by a coal as it is heated and the swelling and subsequent shrinkage as the coal becomes coke are phenomena of great importance both in the carbonization and in the combustion of coal. Many tests, both simple and involved, have been developed by different investigators and attempts at correlation of the tests and interpretation of their significance is difficult. To attempt to bring some order into the picture and develop, if possible, a satisfactory standard method for the determination of the plasticity and swelling as they apply both to carbonization and combustion, Committee D-5, Coal and Coke, of the American Society for Testing Materials has recently organized Subcommittee XV on Plasticity and Swelling of Coal. The subcommittee is headed by C. C. Russell, of the Koppers Co., Philadelphia, Pa.

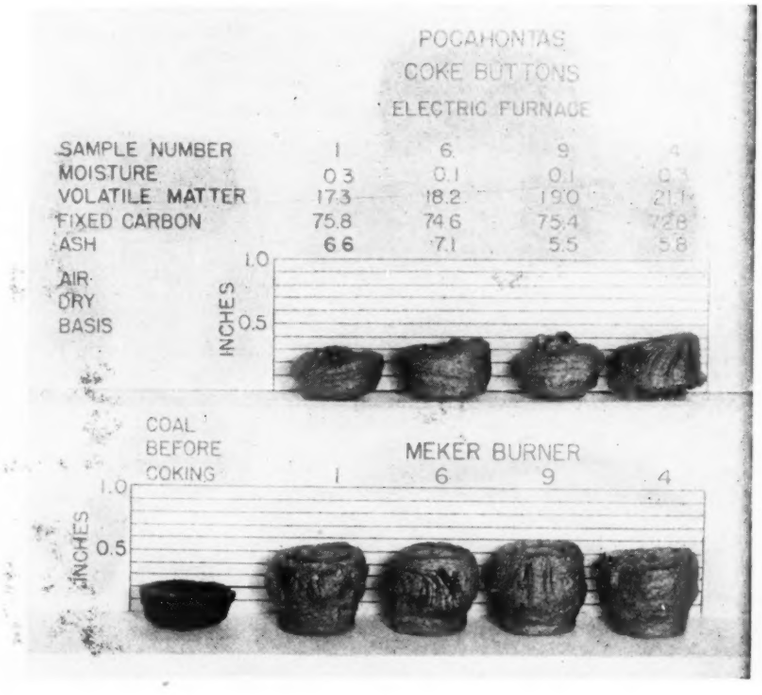
An example of the complexity of the subject and the effect of seemingly small factors on the swelling of coal recently was experienced at Battelle Memorial Institute in research on coal for stokers for Bituminous Coal Research, Inc. In a forthcoming technical report which will present the results of burning tests of four coals, the effect of heat on the coals is illustrated by photographs of coke buttons prepared by the standard method for the determination of the volatile-matter content of coal.

One of the coals included is from the Pocahontas No. 3 seam. Coal from this seam is known generally as strongly swelling, but the coke button made from the coal was only slightly swelled, although it was strong and well coked. This apparent anomaly was noted by several fuel technologists who read the manuscript. They noted that the results differed from those of Rose and Sebastion in "Changes in Properties of Coking Coals Due to Moderate Oxidation during Storage" (Transactions, Coal Division, A.I.M.E., 1930, p. 556), where strongly swelled coke buttons of Pocahontas No. 3 coal are shown.

To determine whether the particular Pocahontas No. 3 coal differed from other Pocahontas coals in its coking characteristics or whether it had oxidized enough in the period since it had been mined to change its coking characteristics, fresh samples from nine mines in the Pocahontas field were obtained through the courtesy of W. E. E. Koepler, secretary, Pocahontas Operators' Association. Coke buttons were made by the same method: the standard electric-furnace, volatile-matter test from the nine coals. The button of the fresh coal from the same mine as that from which the original sample was obtained was identical with the original button. Others varied somewhat in the amount of swelling and none gave the type of button shown by Rose and Sebastian.

An inquiry to Dr. Rose brought the reply that the buttons pictured in their paper were prepared by heating the coal in a crucible over a Meker burner. This method is an alternative method under

How heating methods affect type of coke buttons



the A.S.T.M. standard at present when extreme accuracy in the volatile-matter content is not required.

The accompanying illustration shows the difference in the type of coke buttons obtained from four of the coals when heated in the two ways. The upper buttons were obtained by placing the crucible in the furnace at 950 deg. C. for 7 minutes. The lower buttons were obtained by heating the crucible over the flame of a No. 4 Meker burner with a flame 15 cm. high for 7 minutes. The difference in the type of button is marked; the gas burner, because of its different rate of heating, gives the strongly swelled button which is generally considered typical of Pocahontas coal.

That such great differences in the swelling of coal can occur when the time and the final temperature are the same is indication that great differences in the coking tendencies of coal will be shown in fuel beds when the coal is fired and burned at different rates.

Anthracite Conference Shows Renewed Support

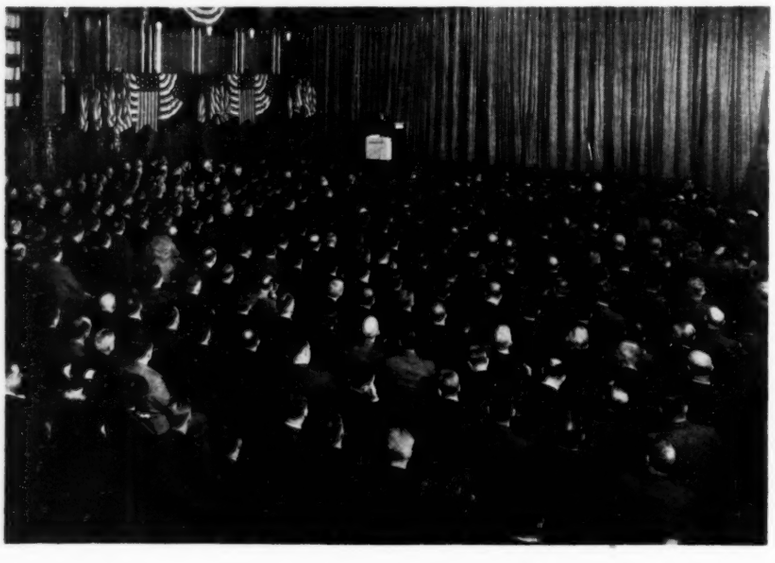
More than 600 representatives of the anthracite industry and allied business groups took part in a convention held April 26 by Anthracite Industries, Inc., at the Commodore Hotel, New York. With Frank W. Earnest, Jr., president of the organization, presiding, there were addresses, demonstrations and graphic and dramatic presentations of modern methods and equipment for the economical use of hard coal. It also was revealed that, whereas the organization has an appropriation of slightly more than $600,000 for its first year of operation, an allotment of more than $1,000,000 is expected for the coming year.

Allen J. Johnson, director, Anthracite Industries research laboratory, Primos, Pa., in the opening address, outlined the increased activities there and told of the many opportunities for increased results now that the facilities have been expanded. New developments in the equipment field were covered by A. F. H. Scott, Anthracite Industries staff, whose illustrated "Parade of Products" had to be shown in two parts.

In a résumé of the organization's extensive advertising campaign, James P. Duffy, assistant to the president, paid tribute to the cooperation given by coal dealers, equipment manufacturers, members of the plumbing and heating trade and others. These interests, he said, paid for 6 in. of space in addition to every 10 in. occupied by Anthracite Industries advertising, in order to get across the message of modern anthracite equipment. The speaker also stressed the possibilities revealed by the coal merchants of Syracuse, N. Y., in winning back from competitive fuels about 100,000 tons for domestic water heating in five years. Excellent progress also was shown by a campaign in Milwaukee, Wis.

Professors Borden and Busse, of New York University, who have made a scientific study of selling, put on an original act illustrating effective and ineffective methods. Their dramatization of salesmanship was so impressive as to evoke genuine enthusiasm. The value of thermostatic control for anthracite equipment was discussed by Arnold Michelson, vice-president, Minneapolis-Honeywell Regulator Co. Support being given by the equipment companies, with prediction of large-scale results, was pointed out by Arthur R. Herske, vice-president and general sales manager, American Radiator Co.; Joseph C. Fitts, executive secretary, Plumbing, Heating and Air-Conditioning Institute; Homer Addams, president, Fitzgibbons Boiler Co., and C. T. Burg, vice-president and general sales manager, Iron Fireman Manufacturing Co.

Anthracite salesmen go to school



TVA Injunction Reversed In Appeals Court

The Tennessee Valley Authority regained lost ground on May 14, when the United States Circuit Court of Appeals at Covington, Ky., dissolved a temporary injunction granted Dec. 14 by Judge John Gore, of the Eastern Tennessee federal District Court, to nineteen private utilities and sent the case back to the lower court for a hearing of their suit to determine the constitutionality of the TVA Act. The Circuit Court ruling held that the injunction was against public interest, in that the loss to the public through failure to obtain cheap electricity could not be measured. In like manner, said the court, the public interest in the achievement of "effective control of the flood waters of the Tennessee River and its tributaries" was "beyond appraisal."

Judges Charles G. Simons, Florence Allen and Charles Moorman were unanimous in vacating the injunction, but Judges Allen and Moorman wrote brief opinions dissenting from portions of the opinion as delivered by Judge Simons. The ruling provided that "the authority is authorized under the act to carry on operations upon the Tennessee River and its tributaries without respect to State lines or the limits of judicial districts, and may acquire by purchase or condemnation anywhere lands, easements or rights of way necessary to carry out the provisions of the act."

The ruling of Judge Gore forbade TVA from starting any new construction, but specified that it might finish construction already started. In the case before the Circuit Court the constitutionality of the act was not involved.

TVA Appeals to High Court

TVA appealed to the United States Supreme Court on May 20 from that part of the Circuit Court's decision remanding the case to the lower court for hearing on the constitutionality of the authority's program. Arguing that "the question here presented must ultimately be decided by this court," the petition said that "no further proceedings in lower courts can aid this court in its determination." Delay in a decision only means "futile, long and burdensome litigation," said the TVA brief.

The bituminous coal industry turned out in force May 4 in favor of an application by the Tennessee Electric Power Co. to the Tennessee Railroad and Public Utilities Commission for permission to erect a new steam electric-power generating plant near Nashville. The occasion was a hearing by the Commission, which ordered the power company to show cause why its facilities in the Nashville area should not be increased to meet a possible power shortage. When the order was issued, the company replied by asking authority to build a coal-burning generating plant. The Commission stated that two courses were possible: such a plant could be

authorized or the company could be compelled to buy power from T.V.A.

Among the interests represented at the hearing were the National Coal Association, which presented a brief through Col. H. J. Weeks, who acted for the coal operators generally; L. C. Gunter, executive vice-president, Southern Appalachian Coal Operators' Association; Justin Potter, president, Nashville Coal Co.; J. E. Tobey, manager, fuel engineering division, Appalachian Coals, Inc.; and Mr. Jones, of District 19, United Mine Workers.

The N.C.A. brief, prepared by J. D. Battle, executive secretary, pointed out that the new $2,000,000 plant, if built, "will utilize an additional minimum of 100,000 tons of coal per annum. It will generate power by steam at exceedingly low cost. It will be of large and direct benefit to the coal fields and to the railroads in this area by providing more work for the miners, more sales for the operators, more revenue freight for the railroads, not for one year but for every year. It will be of benefit to the taxpayers and electric rate payers of the Nashville area."

Industrial Notes

BUCYRUS-ERIE Co. has appointed James W. Bell Co., Cedar Rapids, as its distributor in Iowa territory. The Seattle (Wash.) office of Bucyrus-Erie is now at 3408 First Avenue, South.

ALLIS - CHALMERS MANUFACTURING Co. has opened offices at 211 North Champion St., Youngstown, Ohio, in charge of C. H. Legler, and in the National Bank Building, Knoxville, Tenn., in charge of W. C. Johnson.

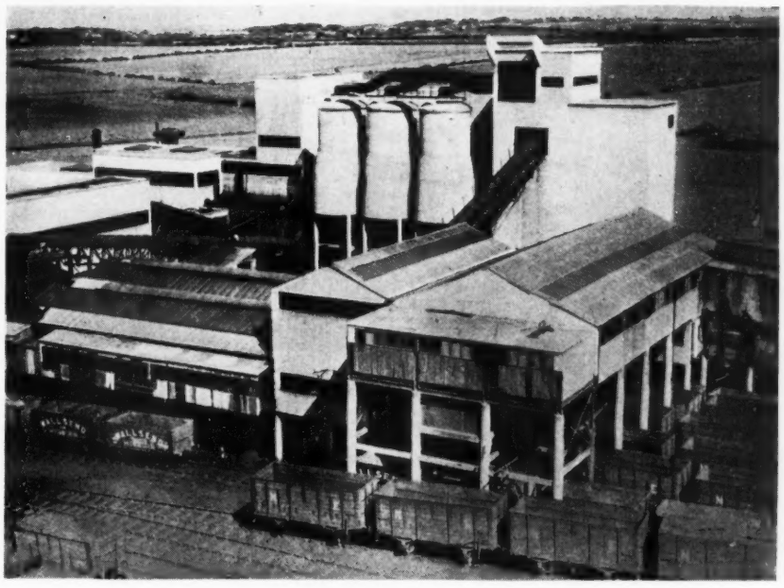
OHIO BRASS Co. has appointed Wade H. Burleson manager of the power utilities department. Formerly assistant manager of the department, Mr. Burleson succeeds M. M. Kenneally, resigned.

EASTON CAR & CONSTRUCTION Co., Easton, Pa., announces that Charles Abeles has joined its sales force, with headquarters in New York. Formerly, Mr. Abeles was with the Koppel Industrial Car & Equipment Co. as assistant sales manager.

IDEAL COMMUTATOR DRESSER Co., Sycamore, Ill., has purchased the Marshall Electric Co., Elkhart, Ind. I. D. Applegate, electrical engineer, formerly with the Westinghouse Electric & Manufacturing Co., will be in charge of engineering, design and development of automatic voltage, current and speed regulators.

ELGIN SOFTENER CORPORATION, Elgin, Ill., announces that William K. Clow, formerly general manager of the Henszey Co., has become identified with its technical staff, specializing in boiler-water conditioning.

GRUENDLER CRUSHER & PULVERIZER Co., St. Louis, Mo., has opened an office at 205 West Wacker Drive, Chicago, under T. A. Oberhellmann, zone manager.



Coal plant adjudged an architectural gem

Coal Plant Wins Honor

The Wallsend and Hebburn preparation plant of the Rising Sun Colliery, Wallsend-on-Tyne, England, was the best building constructed in Great Britain during 1936, according to Prof. C. H. Reilly, in his annual article on the year's architectural achievements, in the *Architects' Journal*. After a careful survey of numerous structures, his choice fell on the colliery building with this statement: "The new Wallsend colliery preparation plant structure, white and clean, as carefully arranged by Prof. R. A. Cordingley to express its functions and do its work economically and well, is the best building of 1936—cathedrals, churches, hospitals, cinemas, schools, blocks of flats and country houses, King's or otherwise, notwithstanding."

A.C.I. Studies Research

Fuel engineers, coal chemists, executives and other representatives of the companies affiliated with Appalachian Coals, Inc., met at Cincinnati, Ohio, on May 19 for its nineteenth fuel engineers' meeting. J. T. Tobey, manager, fuel engineering division, presided and nearly 200 attended the two sessions, which were devoted to coal research. H. N. Eavenson, president, Clover Splint Coal Co., and a director of Bituminous Coal Research, Inc., sounded the keynote of the conference in emphasizing the need for "fundamental and practical knowledge." This theme was elaborated by John C. Cosgrove, president of the West Virginia Coal & Coke Corporation and of Bituminous Coal Research, Inc.

Current and proposed research in automatic residential heating was discussed by Ralph Sherman, Battelle Memorial Institute. E. G. Bailey, vice-president, Babcock & Wilcox Co., spoke on "Projection Lines for Coal Research"; Dr. Stephen P. Burke, consulting engineer, presented "A New Outlook for Coal Research"; Dr. A. C. Fieldner, chief, technologic branch, U. S. Bureau of Mines, told of "The Relation of the U. S. Bureau of Mines to Research," and L. A. Shipman, fuel engineer, Southern Coal & Coke Co., talked on "Coal Research and Fuel Engineering."

Other speakers were J. D. Doherty, research engineer, Koppers Coal Co.; A. W. Gauger, director, mineral industries research, Pennsylvania State College; G. B. Gould, president, Fuel Engineering Co. of New York; B. M. Guthrie, chairman, engineering committee, National Stoker Manufacturers' Association; C. E. Lawall, director, School of Mines, West Virginia University; O. O. Malleis, manager, mine inspection division, Appalachian Coals, Inc.; M. A. Mayers, Coal Research Laboratory, Carnegie Institute of Technology; J. B. Morrow, preparation manager, Pittsburgh Coal Co.; P. Nicholls, supervising engineer, fuels section, U. S. Bureau of Mines, Pittsburgh, Pa.; George G. Ritchie, fuel service engineer, Chesapeake & Ohio Ry.; R. L. Rowan, fuel engineer, General Coal Co.; and J. G. Worker, general sales manager, American Engineering Co.

Financial Reports

Consolidation Coal Co., Inc., and subsidiaries—Profit for three months ended March 31, $413,059 after interest on 5 per cent secured notes and loans but before interest on 5 per cent sinking-fund bonds (three months' interest on these bonds totals $100,817). Profit in first quarter of 1936 was $304,968 including $228,461 profit from North Western Fuel Co., a wholly owned subsidiary, but before $114,902 provision for interest on 5 per cent sinking fund

bonds, which were charged against surplus account.

Island Creek Coal Co. and subsidiaries—Net income for three months ended March 31, $401,829, against $388,133 income in the first quarter of 1936.

Lehigh Coal & Navigation Co.—Consolidated net income for twelve months ended March 31, $259,354, including company's proportion of undistributed earnings and losses of subsidiaries, compared with $352,011 income in preceding twelve months.

Northern Illinois Coal Corporation—Net income for 1936, $339,096, against $335,387 in 1935.

Old Ben Coal Corporation—Net loss for twelve months ended March 31, $254,867, against loss of $295,283 in preceding twelve months.

Pennsylvania Coal & Coke Corporation—Profit for three months ended March 31, including income from allied companies operated by virtue of Clearfield Bituminous Coal Corporation lease, $1,229 before federal income taxes, compared with profit of $26,691 in first quarter of 1936.

Pond Creek Pocahontas Co.—Net profit for three months ended March 31, $40,655, compared with $104,512 in first quarter of 1936.

Virginia Iron, Coal & Coke Co.—Net loss for three months ended March 31, $29,698, against $21,446 loss in first quarter of 1936.

West Virginia Coal & Coke Corporation—Net loss for three months ended March 31, $13,216, compared with $22,977 loss in first quarter of 1936.

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Coal Fellowships Offered

Research fellowships for twelve months in coal and non-metallics for 1937-38, beginning July 1, are offered by the College of Mines, University of Washington. Each fellowship, which carries $720, is open to graduates of universities and technical schools who are qualified to make the investigations. Full details may be obtained from Dean Milnor Roberts, Seattle, Wash.

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New Anthracite Stoker

A new anthracite stoker has been introduced by Link-Belt Co., which emphasizes that it is not a converted bituminous model but was designed and is built in anthracite territory strictly to burn hard coal. Among the features of the new unit claimed by the manufacturer are: patented ash ring which shears the ash off the edge of the firepot and permits a larger firepot to be used in the boiler; plunger-type coal feed, of phosphor bronze, which is long-lived; plunger-type ash conveyor (on-floor-level and ash-elevator types) which resists the abrasive action of anthracite ash, is noiseless and is economical in power consumption. The unit is available in either hopper or bin-feed types and comes in various sizes.

STOKER SALES CLIMBING

Sales of mechanical stokers in March last totaled 5,585 units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers (Class 1, 58; Class 2, 33; Class 3, 33; Class 4, 32; Class 5, 19). This compares with sales of 3,286 units in the preceding month and 2,785 in March, 1936. Sales by classes in March last were: residential (under 61 lb. of coal per hour), 4,923 (bituminous, 4,439; anthracite, 484); small apartment house and small commercial heating jobs (61 to 100 lb. per hour), 236; apartment-house and general small commercial heating jobs (101 to 300 lb. per hour), 167; large commercial and small high-pressure industrial steam plants (301 to 1,200 lb. per hour), 159; high-pressure industrial steam plants (over 1,200 lb. per hour), 100.

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No Blame Placed for Blasts

The April grand jury of Schuylkill County, Pennsylvania, failed to return a true bill against the Philadelphia & Reading Coal & Iron Co. and John R. Sharpe, general manager; S. W. Blakslee, production manager; William Jones, superintendent, and J. J. Keating, inside foreman, who were charged by the State Department of Mines with being criminally negligent as to the Gilberton colliery explosion of Jan. 21, 1935. The Commonwealth brought criminal action and had the men arrested on Dec. 24, but they were released on total bail of $65,000.

A coroner's jury decided at Punxsutawney, Pa., on April 26 that no one was criminally liable for the explosions which killed nine men in the Kramer mine of the Northwestern Mining & Exchange Co. on March 27. The jury heard six hours of testimony from mine officials.

Institute Releases Program

Safety, welding, coal cleaning and coal selection will engage the attention of attendants at the summer meeting and boat trip of the Illinois Mining Institute. The meeting will be held aboard the Steamer "Golden Eagle," which will leave St. Louis, Mo., at 10:30 p.m., June 11, and return at 9 a.m., June 13.

After an address of welcome by W. J. Jenkins, president of the institute and president of the Consolidated Coal Co., the following papers will be presented: "Selling of Accident Prevention to the Management," H. G. Westerland, director of compensation, Chicago, Wilmington & Franklin Coal Co.; "Electric Arc and Oxyacetylene Welding," Carl Lee, chief engineer, Peabody Coal Co.; "Recent Developments in Bituminous Coal Cleaning," William C. McCulloch, chief chemist, United Electric Coal Cos.; "Coal Selection From the Consumer's Viewpoint," K. C. Richmond, editor, *Coal-Heat*. Among those who will take part in discussion of the papers are Alexander U. Miller, associate mining engineer, U. S. Bureau of Mines, Vincennes, Ind., and Henry F. Hebley, preparation engineer, Commercial Testing & Engineering Co.

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Mine Fatality Rate Climbs

Coal-mine accidents caused the deaths of 115 bituminous and 18 anthracite miners in March last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 50,720,000 tons, the bituminous death rate in March was 2.27 per million tons, compared with 1.75 in the preceding month and 2.13 in March, 1936. The anthracite fatality rate in March last was 3.76, based on an output of 4,781,000 tons, as against 4.45 in the preceding month and 6.53 in March, 1936. For the two industries combined, the death rate in March last was 2.40, compared with 1.95 in the preceding month and 2.52 in March, 1936.

Comparative fatality rates for the first three months of 1936 and 1937, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January–March, 1936 and 1937

	Bituminous				Anthracite				Bituminous-Anthracite	
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Killed per Million Tons	
Cause	1936	1937	1936	1937	1936	1937	1936	1937	1936	1937
Falls of roof and coal	156	141	1.387	1.054	45	28	2.928	2.300	1.572	1.158
Haulage	46	58	.409	.434	5	9	.325	.740	.399	.459
Gas or dust explosions:										
Local explosions	4	2	.036	.015	10	....	.651	....	.109	.014
Major explosions	8	27	.071	.202	....	....	....	....	.063	.185
Explosives	9	2	.080	.015	7	2	.456	.164	.125	.027
Electricity	6	12	.053	.090	2	1	.130	.082	.063	.089
Mining machines	6	3	.053	.022	....	....	....	....	.047	.021
Other machines	1	2	.009	.015	1	....	.065	....	.016	.014
Miscellaneous:										
Minor accidents	7	5	.062	.037	7	5	.456	.411	.109	.068
Major accidents	....	....	....	....	....	....	....	....	....	....
Shaft:										
Minor accidents	3	10	.027	.075	2	1	.130	.082	.039	.075
Major accidents	....	....	....	....	....	....	....	....	....	....
Stripping or open-cut	5	4	.045	.030	3	3	.195	.246	.063	.048
Surface	9	20	.080	.149	7	3	.456	.246	.125	.158
Grand total	260	286	2.312	2.138	89	52	5.791	4.271	2.730	2.316

* All figures subject to revision.